A COMPARATIVE STUDY OF ANATOMICAL REPAIR VERSUS MESH REPAIR IN INCISIONAL HERNIA REPAIR SURGERY

DISSERTATION SUBMITTED TO COIMBATORE MEDICAL COLLEGE
FOR M.S. DEGREE IN
GENERAL SURGERY BRANCH I

The Tamilnadu
Dr. M.G.R. Medical University
CHENNAI.

MARCH 2010

CERTIFICATE

Certified that this is the bonafide dissertation done by **Dr. R. RADHIKA** and submitted in partial fulfillment of the requirements for the Degree of M.S., General Surgery, Branch I of The Tamilnadu Dr. M.G.R. Medical University, Chennai.

Date : Unit Chief

Date : Professor & Head
Department of Surgery

Date : Dean
Coimbatore Medical College
Coimbatore - 641 014

DECLARATION

I solemnly declare that the dissertation titled **"A COMPARATIVE STUDY OF ANATOMICAL REPAIR VERSUS MESH REPAIR IN INCISIONAL HERNIA REPAIR SURGERY"** was done by me from 2007 onwards under the guidance and supervision of **Professor Dr. A. Ramamurthy M.S.**

This dissertation is submitted to the Tamilnadu Dr. MGR Medical University towards the partial fulfillment of the requirement for the award of MS Degree in General Surgery (Branch I).

Place : **Dr. R. RADHIKA**

Date :

Coimbatore Medical College

COIMBATORE, TAMILNADU, INDIA - 641 014

(Affiliated to The T.N. Dr. MGR Medical University, Chennai)

ETHICS COMMITTEE

CERTIFICATE

Name of the Candidate : Dr. Radhika .R

Course : M.S. General Surgery

Period of Study : 2007 - 2010

College : Coimbatore Medical College

Dissertation Topic : Comparative study of anatomical repair versus mesh repair in incisional hernia repair surgery.

The Ethics Committee, Coimbatore Medical College has decided to inform that your Dissertation is accepted / ~~Not accepted~~ and you are permitted / ~~Not Permitted~~ to proceed with the above Study.

Coimbatore - 14.

Date : 13.02.08

Secretary
Ethics Committee

ACKNOWLEDGEMENT

I am extremely thankful to **Dr. V. Kumaran, Dean In-charge and Head of the Department of Paediatric Surgery** of Coimbatore Medical College & Hospital, for allowing me to utilize the hospital facilities for doing this work and providing the inspiration to complete this study.

I am greatful and deeply indebted to **Professor and Head of the Department of Surgery, Dr. P. Govindaraj** for the whole hearted help given to me.

I express my deep sense of gratitude to my **Unit Chief, Professor of Operative Surgery, Dr. A. Ramamurthy** for the able guidance and encouragement rendered to me throughout the course of this work.

I thank all the **Surgical Unit Chiefs**, **Prof. Dr. G. Mohan, Prof. Dr. P.M. Nanjundappan, Prof. Dr. P.V. Vasantha Kumar** and **Prof. Dr. Kattabomman** for their advice.

I also wish to thank **Retd. Former Professor of Operative Surgery Dr. Premthamarai Selvi**, for her guidance.

I thank all my **fellow post graduates** and **CRRI's** for their help..

And finally I would like to place on record my sincere thanks to the **patients** whose co-operation made this study possible.

CONTENTS

No disease of the human body belonging to the province of surgery requires a greater combination of knowledge with surgical skill than hernia in all its variety.

SIR ASTLEY COOPER

If we could artificially produce tissues of the density and toughness of fascia and tendon, the secret of radical cure of hernia would be discovered.

THEODORE BILLROTH
(1829-1894)

INTRODUCTION

INTRODUCTION

Incisional hernia is defined as the hernia, which develops in the Scar following a surgical incision. It is otherwise called as ventral abdominal hernia or Iatrogenic hernia. It is a perfect example of the old aphorism that “Ounce of prevention is worth a pound of cure”. With increase in number of abdominal operations the number of incisional hernias has increased considerably.

The incisional hernias are the result of failure of the lines of closure following laparatomy. Satisfactory closure of abdomen incisions still remains a challenge. There are occasions when incisional hernias develop inspite of skillful methods due to other factors like sepsis, cough, abdominal distension, obesity, diabetes etc. Surgeons should take every effort to prevent such an event. By careful case selection, preoperative preparation and operative technique it might be possible to prevent incisional hernias.

A number methods of repair of incisional hernias were described but each technique has its failure rate. The ideal goal of zero recurrence is yet to be achieved. Hence this study has been taken up to analyze the incidence, various etiological factors, clinical presentation, Various modalities of treatment and to compare anatomical repair with mesh repair & their outcome.

AIM OF STUDY

AIM OF STUDY

1. To determine the incidence of incisional hernia at Coimbatore Medical College hospital during 2007 to 2009.
2. To study the nature of previous surgery leading to incisional hernia.
3. To study the contributory factors for development of incisional hernia.
4. To study the factors that predispose to incisional hernia.
5. Clinical manifestations of anatomical repair versus mesh repair.
6. To study the complications associated hernia repair.
7. To evaluate effects of treatments and follow up.

REVIEW OF LITERATURES

REVIEW OF LITERATURES

HISTORY

Major abdominal surgeries developed rapidly during last century, along with it brought the increased incidence of incisional hernias. Various methods have been attempted for repairing them during this period.

In 1836, Gerdy successfully repaired incisional hernia. In 1880 Maydil repaired the incisional hernia in layers. In 1889 Mayos described the horizontal overlapping technique for umbilical hernia repair. This was successfully adopted for the incisional hernia.

Repair of this hernia is one of the few instances in surgery in which implants of foreign material were used before the use of natural tissue. Witzel (1900), Bartlett (1903) and Mcgavin (1909) advocated the use of silver wire filigree Koontz (1940) and Throokinortan (1948) used Tantalon gauze.

These metals fragmented within a short time and recurrence occurred. The fragment of the metal caused skin sinuses and even perforation of the bowel. In 1920 Gibson described the use of relaxing incisions made vertically in the anterior rectus sheath for the repair of midline incisional hernia.

Fascialata graft, used in the form of strips or sheets were reported by Mcarthur (1901), Kirschner (1910) and Gallic Mair in 1945 used sheets or strips of skin for repair. These tissues tended to be absorbed and had the disadvantages of recurrence, Sinus formation, dermoid cyst formation.

Darn technique of repair of incisional hernia was introduced early in this century, strips of facialata, skin, even animal tendon were used. Biological threads of silk, cotton and linen were tried. Gosset in 1949 used strips of full thickness autograft skin in darn repair and Abel (1948) used stainless steel for the lattice work. Hunter in 1971 developed the nylon darn technique using monofilament nylon. Abrahanson later described his shoelace darn technique.

After the advent of synthetic plastic materials, plastic sheets (Thomson 1946) and Polyoing sponge (Shoefiel 1955) were used. The modern era of prosthetic hernia repair began in 1958 when Usher reported with polyamide mesh. Use of Mariex mesh was first reported by Usher/1959. Cerise used Merisilene mesh. Recently use of expanded polytetra Fluroethylene mesh (ePTFE) (Gore-tex patch) has been reported by Shar (1980), Jenkin(1983) and Bauer (1987). Leblank ka in (1993) described the laparoscopic repair of incisional hernias using ePTFE.

INCIDENCE

The incidence of incisional hernias vary and occur in 2-13% of all patients undergoing abdominal operation. In Donaldson and colleagues study found only a single incisional hernia in 231 laparotomies. In Regnard (1988) study shows 13% at 5 years of which 80% occur in first 2 years. Shouldice clinic in Toronto documented in a series of 500 incisional hernia showed the incidence within 6 months 52.2%; within one year 67.8% within 2years 78.6%; within 3years 88.4%; within 4years 93.2%; within 5years 97%.

Lamont (1998) reported the incidence of 6% after freshly made incisions, 12% after reincisions and 44% after repair of the incisional hernias at 5 years. Hasselinic (2003) in his study of 417 patients who underwent incisional hernia repair showed the recurrence after 34.9 months was 36%; after 5 years was 41%.

Kadar N in 2004 reported the incidence after major laparoscopic gynaecological procedures as 3.1% in 12mm extra umbilical ports and 0.23% in 10mm extra umbilical ports. Factors such as obesity, diabetes, wound infection, and lower abdominal incisions had higher incidence of incisional hernia and recurrence after repair. Most important was the size of the hernia. Hernias less than 4cm wide had recurrence rate of 25% while more than 4cm recurred in 41%.

ANATOMY OF THE ABDOMINAL WALL

Majority of incisional hernias occurs in abdomen following operation, this invariably follows disruption of anatomy. To understand the pathological anatomy of incisional hernia, a detailed study of abdominal wall is necessary.

Skin of the abdomen

The Langer's lines run for the most part transversely on the abdomen. So the longitudinal incisions that cut across this line tend to retract the wound margins. An incision along the Langer line will heal as a hair line scar, whereas the incisions across the line will heal either a wide or heaped up scar.

Superficial fascia

The superficial fascia of the anterior abdominal wall vanes in the amount of fat from person to person. In the upper part of the abdomen this fascia directly continuous with corresponding layer of the thoracic wall. In its lower part it is divided into (I) a superficial fatty layer - Camper's fascia, which continues, with superficial fascia of the thigh (ii) deep membranous layer, Scarpa's fascia which fuses with the deep fascia of the thigh just below the inguinal ligament.

Muscles of the anterior abdominal wall

The three muscle layers of the body wall are separated in the flanks where they are known as the external oblique, internal oblique and transverse abdominis muscles The layers fuse together ventrally to form the rectus abdominis muscle.

The aponeurosis of the internal oblique splits into anterior and posterior layers to enclose the rectus muscle. The external oblique aponeurosis fuses with the anterior layer to form the anterior layer of the sheath, and the transverses aponeurosis fuses with the posterior layer to form the posterior layer of the sheath. A little below the umbilicus, all three aponeurosis passes infront of the muscle. There is thus a free lower margin to the posterior layer. It is concave and properly named the ARCUATE LINE or SEMICIRCULAR LINE of Douglas.

Pyramidalis muscle arises from the pubic crest between the rectus abdominis and its sheath. It converges with its fellow into the linea alba an inch or more above its origin.

In between the two recti all the aponeurosis decussate to form the linea alba, a strong midline fibrous structure which is firmly attached to the xiphoid process above and pubic symphisis below. In 30%, the decussation was observed to take place along a single line at the midline.

In 70% there are two additional lines of decussation, one on either side of the midline decussation, that is triple decussation. The triple pattern of decussation was observed above the level of umbilicus. Below that level only a single line pattern was observed. This may be the answer to why midline subumbilical incision is more prone to post operative herniation, the subumbilical portion of the linea alba being of the weaker single midline decussation type.

The combined contraction of the oblique muscles and the transverse abdominis are directed horizontally. Hence post operatively the strains in the suture line is high in the vertical incision. In the horizontal incisions the contraction tend to approximate the ends.

Nerve Supply

The rectus muscle and external oblique are both supplied by the lower intercostal and subcostal nerves; Internal oblique and transverse abdominis supplied by the same nerves in addition to ilio hypogastric and ilioinguinal nerves. Pyramidlalis is supplied by subcostal nerves.

Blood Supply

Superior epigastric artery is a terminal branch from internal thoracic artery. Inferior epigastric artery is a branch from external iliac artery. Both these supply mainly rectus sheath and muscles also anterolateral abdominal muscles. Anterolateral muscles are also supplied

by lumbar and deep circumflex iliac arteries. Venous drainage accompany these arteries draining to internal thoracic and external iliac veins.

Transversalis Fascia

It is actually a portion of the inner layer of connective tissue which envelops the whole abdominal cavity. Thus the transversalis fascia of one side is continuous with that of the other side behind the rectus sheath.

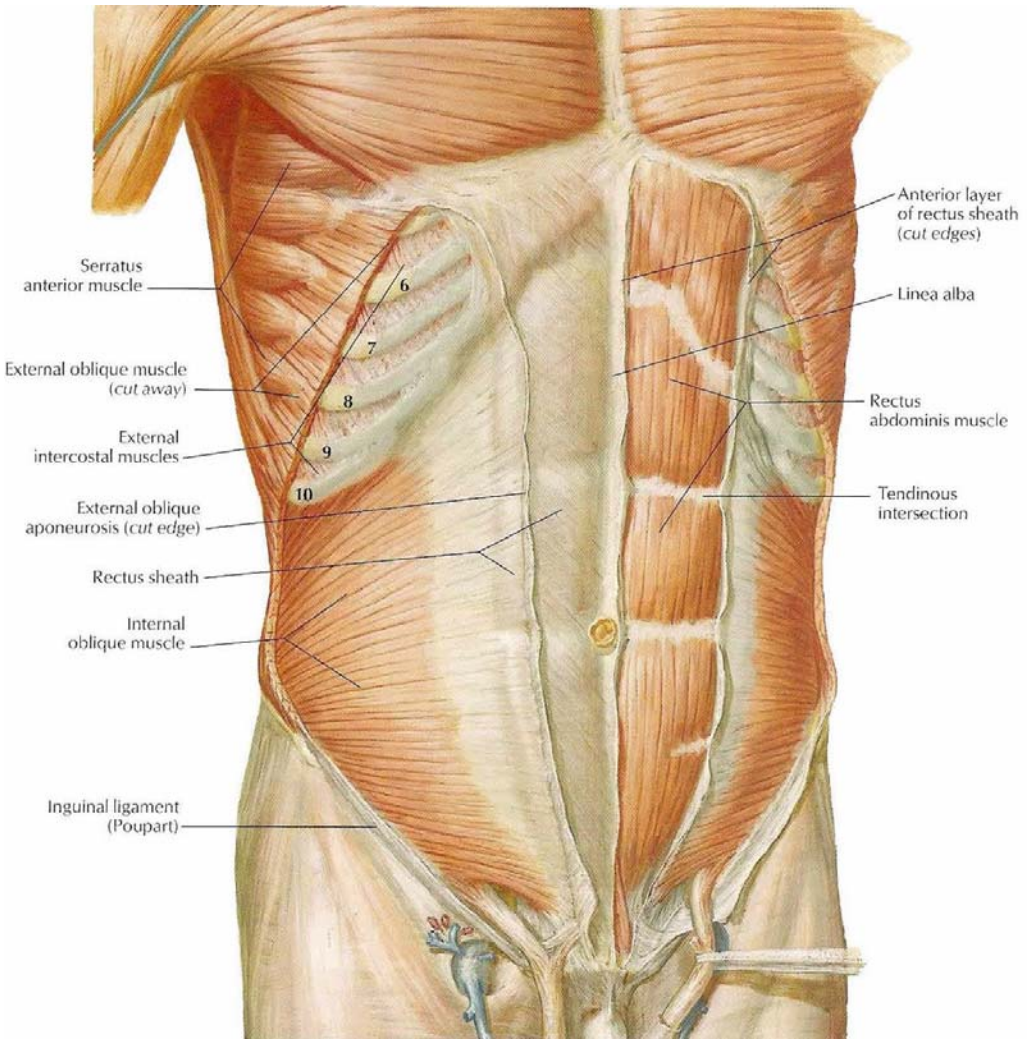
Extra peritonial Tissue

It is a fibroalveolar tissue present in between the peritoneum and transversalis fascia.

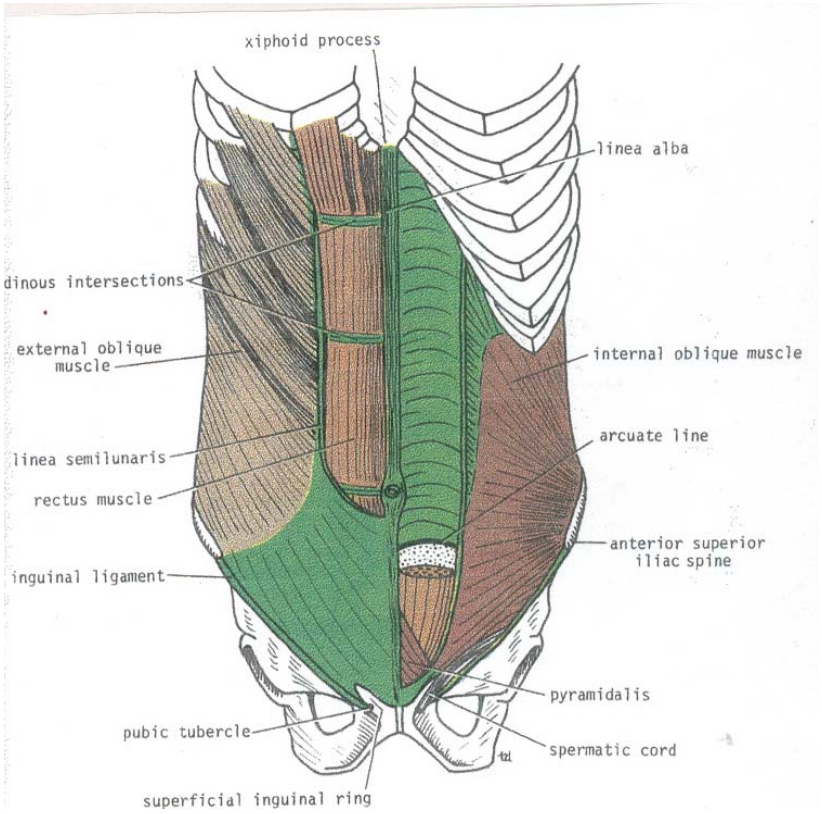
Peritoneum

It is the largest and most completely arranged serous membrane in the body and lines the abdominal wall and is reflected over the contained viscera.

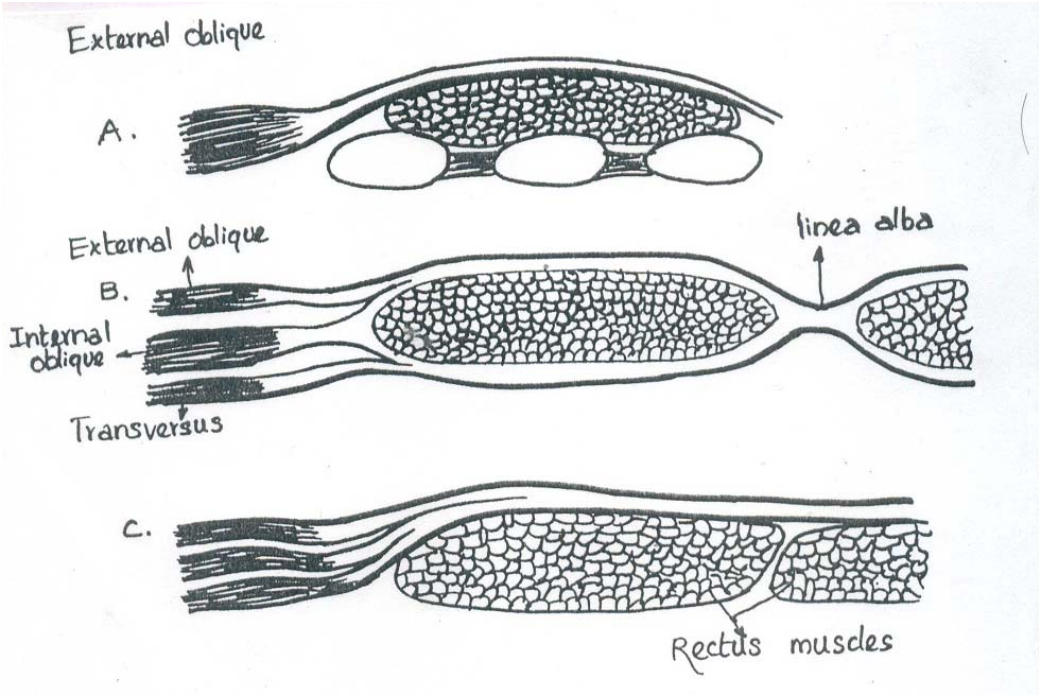
ANATOMY OF THE ABDOMINAL WALL



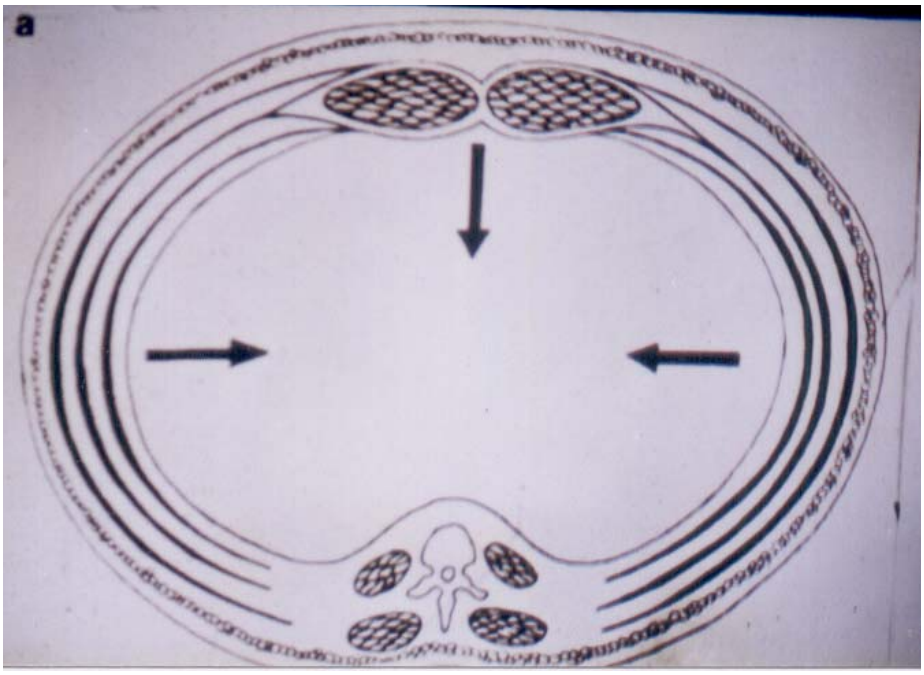
ANATOMY OF THE ANTERIOR ABDOMINAL WALL



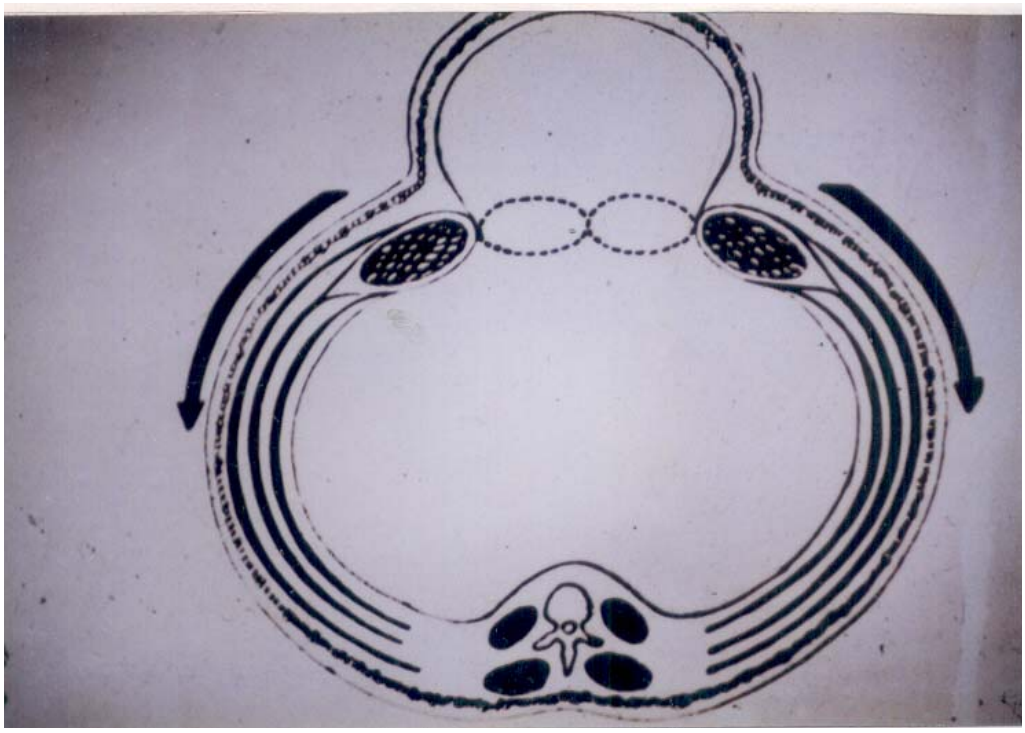
FORMATION OF THE RECTUS SHEATH



CROSS SECTION – NORMAL ANATOMY OF THE ANTERIOR ABDOMINAL WALL



CROSS SECTION – PATHOLOGY IN INCISIONAL HERNIA



AETIOPATHOGENESIS

It can be readily assumed that all the incisional hernias are acquired. They are latrogenic in origin, in that they follow operative procedures that require incision and closure of the abdominal wall. The strength of the abdominal wall resides in the aponeurotic layer, the linea alba and the rectus sheath. These layers are slow to heal and regain 80% of the strength after 6 months and maximal strength at 1 year after suturing.

Many factors, single or multiple may cause failure of satisfactory wound healing. Those factors involved are discussed here.

1. TYPE OF INCISION

Incisions through abdominal wall are based on the anatomical principles. Non anatomic incisions are important causes of incisional hernias.

a. A vertical pararectus incision along the outside of the lateral border of rectus sheath destroys the nerve and vascular supply to the tissue medial to the incision and causing them to atrophy and weakness.

b. Posterior rectus sheath is deficient below the arcuate line. So subumbilical vertical incision lead, to incisional hernia.

c. Muscle cutting incisions across the direction of fibers lead to weakness.

d. In a vertical incision, postoperatively the strains in the suture line are high due to contraction of oblique and transverse abdominis muscles are directed horizontally.

Ellis H et al in 2001 in his follow up showed the incidence to ‘incisional hernias after midline incisions 23%; paramedian as 48%; and transverse incisions as 14%.

Lateral paramedian incision gives the fewer incidences to incisional hernia. Cox and Allan Pollock of Scarborough (1986) in their study shows 12.6% in midline incision and 1.2% in lateral paramedian incision.

2. SUTURE MATERIAL

The healed wound takes about 1 year to gain the maximum strength. So it must be supported with proper suture materials. Catgut and other absorbable suture materials lose 50% of their strength in two weeks and disintegrate in 1.5 months. Silk, cotton and linen disintegrate after 2 months, So should not be used. The ideal suture material used for closure

is non-absorbable material like stainless steel wire. Golinhor (1975) reported <1% of hernias in using stainless wire. Another alternative is using monofilament polypropylene, as a single thread or in the form of a loop.

3. SUTURING TECHNIQUE

In a vertical incision small tightly tied sutures may cutoff tissue and cause ischaemia and necrosis of the tissues. The layered closures also have high rate of incisional hernia due to closely placed many more sutures and insufficient bites of each of this layer. Continuous sutures also has high incidence of incisional hernia due to jeopardised vascularity. The rate of hernias are higher if suture material length.; wound length ratio is less than 4 (Isaraeisson 1996).

4. TENSION

Closing the wounds with either the tissue under tension or tight sutures cause pull in the opposite direction by the abdominal muscles and creates an area of pressure necrosis, causing incisional hernia.

5. TYPE OF OPERATION

Laparotomy for generalized or localized peritonitis in patient with perforated peptic ulcer, appendicitis, diverticulitis and pancreatitis and operation for malignancies, chronic inflammatory bowel disease cause increased incidence of incisional hernias. Also incisional hernias are most common in emergency surgeries than elective ones and in Obstetric & Gynaecological surgeries like LSCS, Puerperal Sterlisation and Hysterectomies.

6. PLACEMENT OF DRAINAGE TUBE

Drains brought out through the original incision especially when left for long time lead to more chances for incisional hernia.

7. Some postoperative complications lead to high incidence of incisional hernia.
    a. Cough due to COPD, asthma, Pneumonitis.
    b. Constipation.
    c. Straining at micturition due to stricture urethra or enlarged prostate.

d. Post operative abdominal distension.

e. Wound infection.

f. Patients on steroids, immunosuppressive therapies.

g. Early removal of sutures.

8. NUTRITIONAL FACTORS

Anaemias, Avitaminosis, Hypoprotienimia

9. Certain types of patients like old age group, obesity, diabetes, alcoholics, patients with chronic renal diseases and hypertension.

10. Peacock in 1978 showed the deficiency of collagen and abnormalities in its physico chemical structure, manifesting in reduced hydroxy proline production and changes in the diameter of the collagen fibers in patient with late developing and recurrent hernias. In 1981 Read and canon postulated that the hernia is part of widespread connective tissue disorder associated with emphysema.

CLINICAL FEATURES

Incisional hernia presents no difficulties in diagnosis. There is great variation in the degrees of herniation The hernia may occur through a small portion of the scar, rarely as a diffuse bulging of the whole length of the incision. In some cases, the fascial defect may be small. In obese persons this may be masked but symptoms of incarceration and strangulation may be there. In long standing cases the skin becomes atrophic and normal peristalsis may be seen. Sometimes ulceration and necrosis of the overlying skin can occur.

Symptoms:

a. Bulge in the operation scar.
b. Dragging pain.
c. Great deal of discomfort.
d. Lack of security in the abdominal wall.
e. Uncomfortable sense of weakness and inability to work.
f. Digestive disturbances like constipation, vomiting and dyspepsia.
g. Bladder disturbance due to pressure on the bladder in pendulous hernia.

In strangulation of the hernia, the symptoms of intestinal obstruction and ischaemic bowel will supervene. Mild attack of incomplete obstruction presents as colicky pain, vomiting. One dreaded complication is spontaneous rupture with evisceration.

PHYSICAL FINDINGS

The main finding is the presence of a mass. If the mass is pushed inside, the defect may be palpated in the rectus sheath. If the mass is irreducible the estimation of the defect is difficult especially in obese patients. The mass may be large or small, reducible or irreducible. The contents may be either bowel or omentum. Sometimes both are matted together and are often adherent to a loculated peritoneal sac so that the hernia is partially or wholly irreducible. Sometimes a skin overlying it is so thin and atrophic that normal peristalsis can be seen in the underlying tissue.

A CASE OF HUGE INCISIONAL HERNIA ANTERIOR VIEW

A CASE OF HUGE INCISIONAL HERNIA LATERAL VIEW

INVESTIGATIONS

Most of the presenting present with incisional hernia will be having other medical complication like hypertension, diabetes, obesity, hypercholesteralaemia. So general medical evaluation is to be done in all patients.

Before going for surgical repair of ventral hernia any other intra abdominal pathology must be excluded by ultrasonogram of abdomen. Content of the hernia, size of the defect can be made also by ultra sonogram.

CT & MRI scan can provide excellent delineation of anterior abdominal wall, confirmation of equivocal hernias, diagnosis of complications such as bowel obstruction and ischaemia. X-rays and barium study will demonstrate hernia-containing bowel and bowel related complications.

INDICATIONS FOR OPERATION

The followings are the indications for repair of ventral hernia :

1. Incisional hernia that produce discomfort and pain to the patients.
2. Irreducible hernia
3. Narrow neck of the defect.
4. Obstruction.
5. Strangulation.

Many incisional hernias produce symptoms of discomfort and pain, and often-recurrent colic if subacute obstructive episodes occur, Such symptoms are reason enough for operative intervention. Irreducibility and narrow neck are further indications for surgery. Obstruction and strangulation are absolute indications for immediate surgery.

CONTRA INDICATIONS

- Extreme obesity.
- Uncontrolled diabetes.
- Cardio respiratory decompensated patients.
- Continuing deep sepsis in the wound.
- Skin infections and intertrigo

MANAGEMENT

The management of incisional hernias is discussed under following headings

1. Preoperative preparations.
2. Operative procedures.
3. Post operative management.

I. Preoperative Preparations

The surgeon's first responsibility in the management of incisional hernia is to avoid creation of another incisional hernia. In order to obtain a long lasting repair to prevent postoperative complication, a very special preparation is required.

a. As far as possible, postpone the surgery till all the precipitating factors are corrected. Eg. : Respiratory problem, urinary obstruction, chronic constipation.
b. If the patient is obese, weight reduction by dieting and exercises should proceed the operation.
c. Strict controls of systemic disorders like diabetes, hypertension and renal disorders.
d. Nutritional factors like Anaemia, hypoprotienimias and vitamin deficiencies should be corrected.

e. Some of the exercises are to be taught to the patient to prevent postoperative complication. Eg. : Breathing exercises, to prevent pulmonary complications, leg exercises to prevent DVT.

In dealing with large incisional hernia or irreducible hernia, pre operative pneumoperitoneum may be beneficial. Patients with massive hernias, which have so significantly reduced the intraabdominal pressure and abdominal musculature, has undergone severe wasting, can no longer yield sufficiently to permit replacement of the viscera within the abdomen. So those are the places to institute preoperative progressive pneumoperitoneum.

Pneumoperitoneum is produced by placing a catheter in peritoneal cavity and introducing air daily to the limit of tolerance, in which intraabdominal pressure is raised to 15-18 cm H20 for up to several weeks preoperatively until the abdomen and hernia are blown up as tight as a drum. If the hernia consists largely of scar, it has little elasticity so that healthy abdominal wall begins to bulge almost at once while the air displaces the hernia into the abdomen. At the same time there is some amount of depression of pelvic floor and a gradual elevation of diaphragm. This technique employed carefully and correctly can enable a primary repair to be successful.

II. Operative Procedures

a. Types of Anaesthesia

It would seem obvious that type of anaesthesia employed for operation plays a insignificant role. It has been established beyond dispute that disruption occurs with equal frequency after local, spinal and general anaesthesia. But mostly now a days endotracheal controlled anaesthesia with a good muscle relaxant, supplemented with epidural cannulation with analgesic is best and is commonly used.

General operative technique

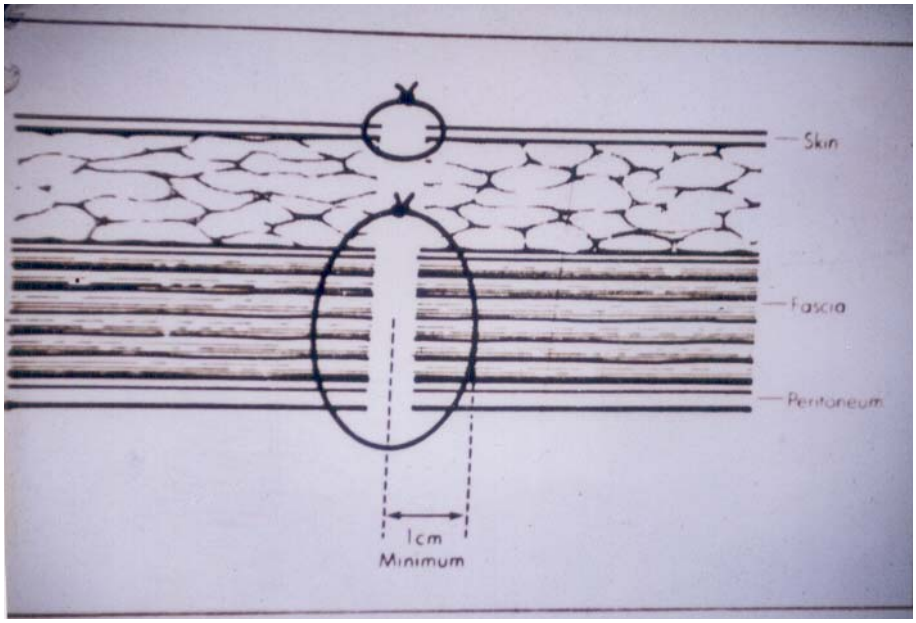
- Incision must be sound – preferably transverse incision along the Langers line.
- Avoid too much retraction of muscles.
- Avoid undue tension in wounds.
- Ensure meticulous haemostasis.
- Selection of suture material must be appropriate.

OPERATIVE METHOD

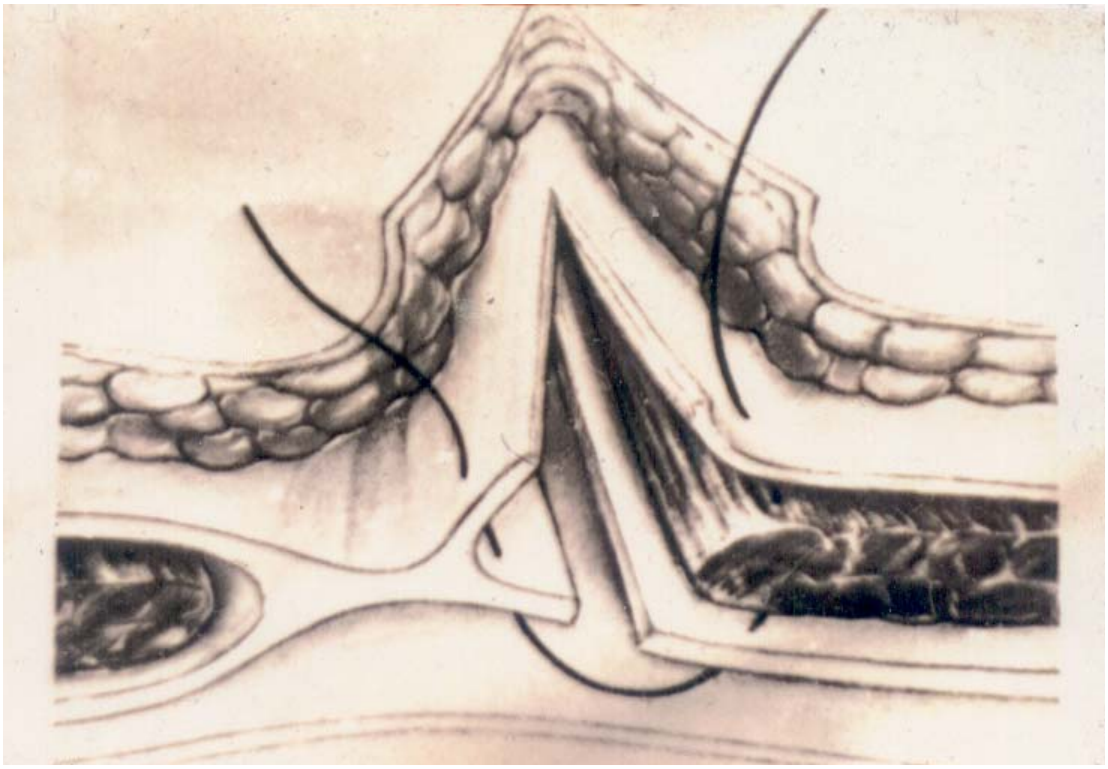
With development of modern synthetic non-absorbable suture material, basic methods have emerged for repair of these distressing hernias.

i. Anatomical Repair
ii. Shoelace darn repair
iii. Double breasting technique
iv. Keel’s Repair
v. Ugahary’s UX Midline Closure technique
vi. Prosthetic Mesh Repair
vii. Laparoscopic Repair.

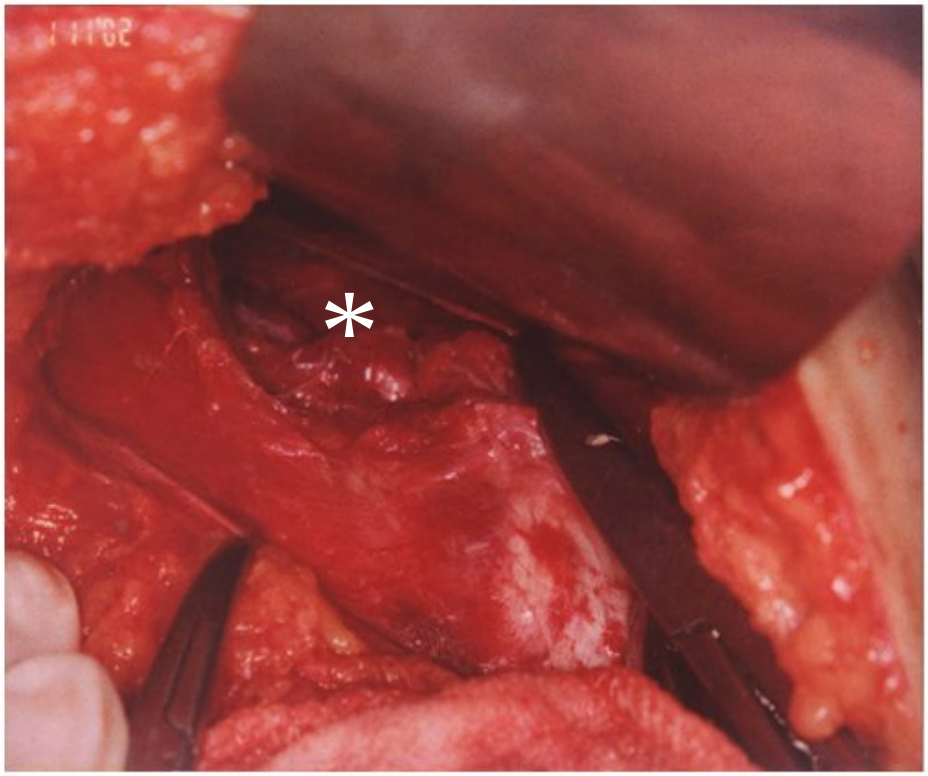
ANATOMICAL REPAIR – MIDLINE INCISION



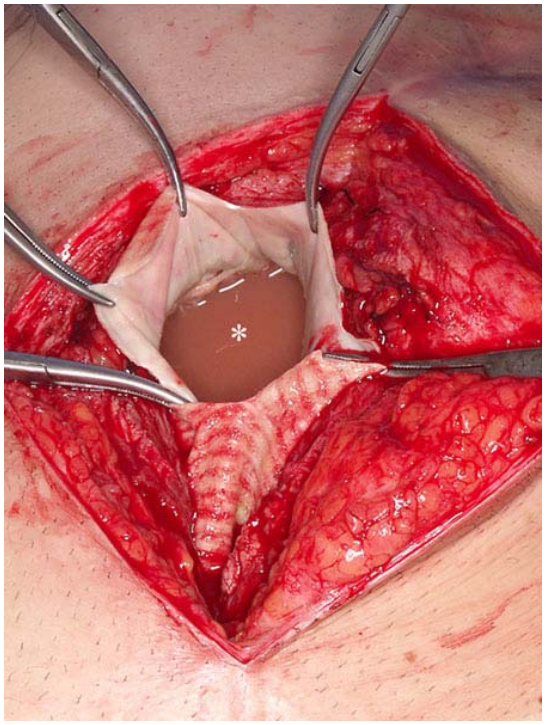
ANATOMICAL REPAIR – PARAMEDIAN INCISION



INCISIONAL HERNIAL DEFECT

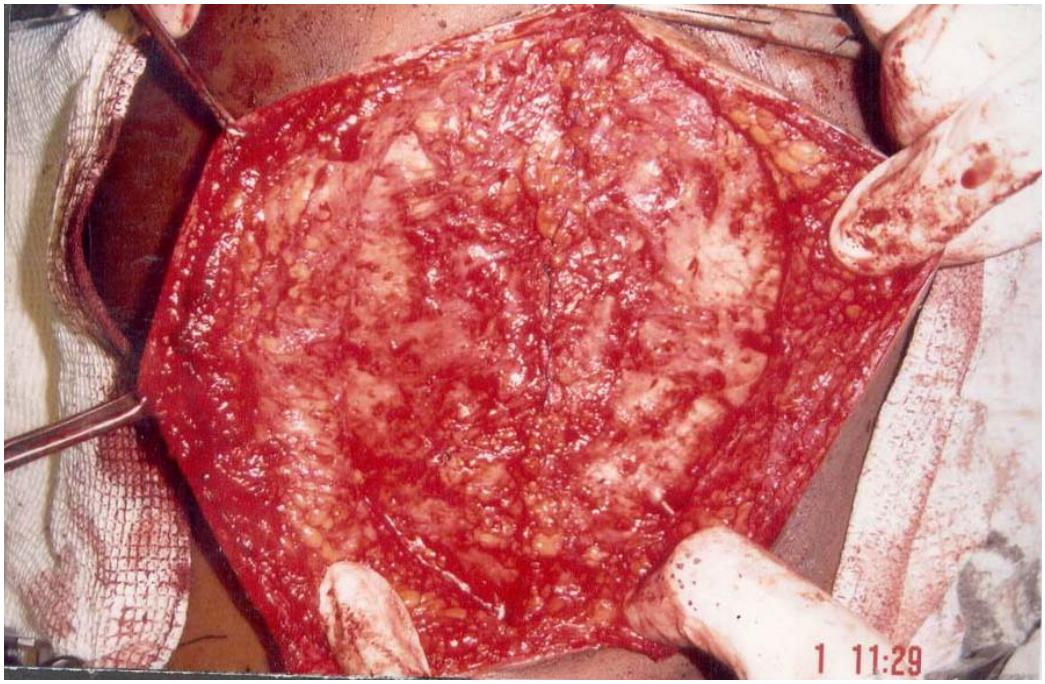


INCISIONAL HERNIAL SAC OPENED

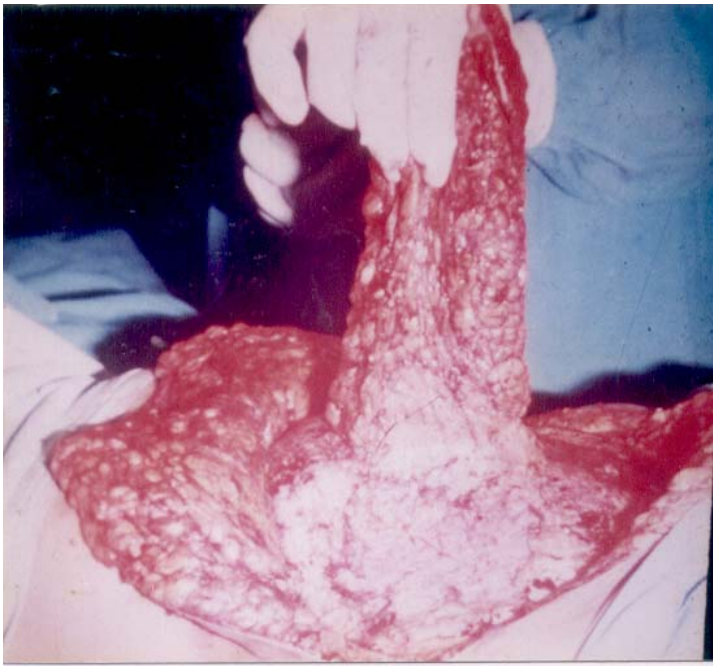


UPPER MIDLINE INCISIONAL HERNIA

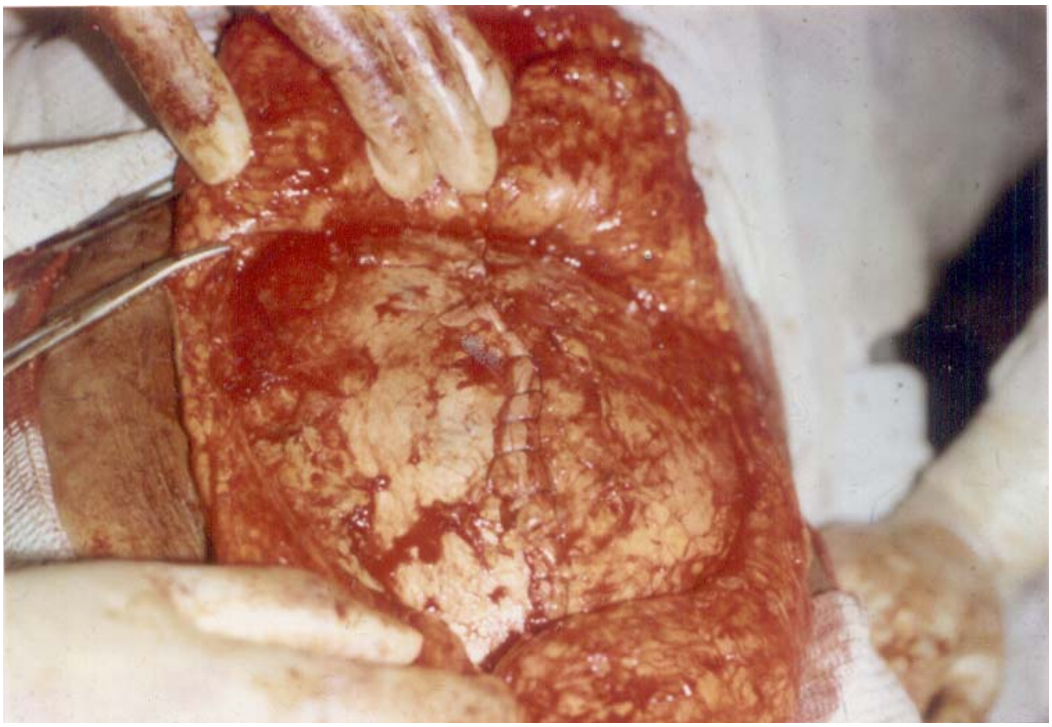
DEFECT CLOSED WITH PROLENE



ANATOMICAL REPAIR – DISSECTION OF SAC



ANATOMICAL REPAIR – COMPLETED



i. Anatomical Repair

The Old Scar is excised in an elliptical fashion and exposes the complete sac down to the muscle and aponeurotic borders of the hernial defect and part of the sheath beyond it. The sac is opened and adherent omentum and bowels are freed. The Sac, scar tissue and old suture materials are excised upto the edge of the hernial defect to expose the normal tissue.

The abdomen is closed with interrupted mass sutures of molofilament strainless steel wire of SW gauge 28, passing through the abdominal wall at least 3cm from the edge of the defect. They shouldn't be tightly tied and should be spaced 2cm apart. A heavy molofilament nylon or prolene thread may be used instead of the steel wire. Alternatively, a continuous heavy monofilament nylon loop mass closure can be used, taking large bites, as with the interrupted closure. The length of the nylon used for the continuous mass closure .should be at least four times the length of the incision. The excess skin is excised, and the wound is closed over the repair with automatic staples or with continuous fine monofilament nylon sutures.

Hernias through paramedian incisions are repaired in the same manner. In this case the. medial edge of the defect will be the intact linea Alba and what remains of the rectus sheath alongside it. The lateral edge

will be composed of anterior and posterior rectus sheath and the rectus muscle between them, with all three layers fused by scar tissue .along the edge. The mass sutures are passed through these two sides.

ii. Shoelace Darn Repair

Basic Principle of this technique is to restore normal anatomy and function. The Operation reconstructs a strong new linea alba midline anchor, allows the rectus muscles to straighten and return to lie along side each other at midline also reconstructs the anterior rectus. sheaths and fixes them to new linea alba.

A Vertical elliptical incision is used, excising the old Scar. The hernial sac is exposed after reflecting flaps raising from the musculo aponeuretic layer. The hernial opening is well defined. An Incision is made in each anterior rectus sheath about 1 cm or more from the medial edges extending away from and parallel to the midline above and below the Sac. The medial Two strips are sewn together from above down wards by continuous suture using monofilament Polyamide loop, thus forming the new linea alba.

The second suture using heavy monofilament loop sutures closes lateral cut edges of the rectus sheaths. Each Starting at one end of the incisions in the rectus sheaths and meeting in the middle of the line of the repair where they are tied one to other. Then this to be continued to and fro in front of the rectus abdominal muscle and through strong new

midline anchor for whole length of the repair in the manner of a shoelace tightening a boot. Then Skin is closed separately using interrupted Nylon sutures. Abrahamson at al author study of this technique given 2% recurrence rate in 500 cases.

iii. Vertical Double Breasting

After excising the scar and freeing the adhesions, the excess sac is excised. The two layers of rectus sheath are separated. Posterior sheath with peritoneum is sutured with absorbable sutures. The anterior rectus sheath are separated from the muscle and vertically, over lapped one over the other and sutured in two rows with interrupted monofilament non absorbable sutures.

iv. Keel's Repair

Extraperitonial repair for midline incisional hernias

- Avoids opening of peritoneum
- Minimizes post operative ileus.
- Allows early mobilization.
- Hernial Sac & neck are dissected, cleaned off fibrofatty tissue & hernia inverted.
- Defect closed.

v. Ugahary's UX Midline Closure Technique

- A new suture technique which gives a early distribution of traction force along the incision line in order to accomplish a better healing process.
- With a tunneling device a tape is inserted on both sides medial in rectus sheath, in a "U" configuration. Then the midline incision is closed with continuous suture, back & forth creating "X" suture pattern.

vi. Prosthetic Mesh Repair

Biomaterials are some times required to bridge or reinforce natural and unnatural defects. These may be classified as ;

1. Natural prosthetic biomaterials
2. Metallic synthetic biomaterials
3. Nonmetallic synthetic prosthesis

a. Prosthetic Natural Biomaterials

- Autogenous Dermal Grafts
- Dermal Collagen Hemografts
- Autogenous Facial Hetrografts
- Preserved Dural Homografts
- Porcine Intestinal Submucosa
- Whole Skin Grafts
- Procaine Dermal Collagen
- Lyophilized Aortic Homografts
- Bovine Pericardiurn
- Cadaveric Dermis

Some of these were used with fairly successful results, but their scarcity and in many cases, cost limited its use and also not available freely and because of that it is not adopted widely.

b. Metallic Synthetic Biomaterials

Use of metal synthetic biomaterials predated development of natural implants.

- Silver filigree
- Tantalum gauze mesh
- Stainless steel mesh

But these were difficult to handle in surgery and were associated with poor resistance to infection, frequent abscess formation and recurrent herniation.

c. Non Metallic Synthetic Biomaterials

i) Nylon mesh
ii) Silastic
iii) Polytetra fluroethylene
iv) Carbon fiber

All these had significant drawbacks like, unreliable infection, poor fibroblast in growth, loosing strength due to hydrolysis & rare potential of Carcinogenicity.

d. Current Synthetic Bio-Materials

1. Polyester Mesh
2. Polypropylene Mesh
3. Expanded polytetra fluro Ethylele Mesh

e. Ideal Characteristics of Synthetic Biomaterials

- No physical modification by tissue fluids
- Chemically inert
- Doesn’t incite inflammatory (or) foreign body reaction
- Non-Hypersensitive
- Non-carcinogenic
- Can be fabricated to any forms or shapes without loss of its strength
- Resistance to mechanical strains
- Can be sterilized by auto calving or disinfections.

f. Polyester Mesh (Dacron, Mersilene)

These prostheses are supple and elastic, confirm to visceral space, have a grainy texture to grip the peritoneum and prevent slippage, and are sufficiently reactive to induce rapid fibroblast response to ensure fixation.

g. Polyprolylene Mesh (Marlex, Prolene)

Usher and co in 1958 introduced polypropylene mesh in incisional hernia. The advantages are :-

- In purulent infection, granulation tissue growth through the mesh with out slougbing or sinus tract is good.
- Inhibit bacterial entrapment.
- Termite strength retained indefinitely.

- Soft, pliable and easy to handle
- Can be autoclaved, trimmed in operating room
- Interstices allow for prompt fixation by collagen, as it is macroporous.
- Because of the above nature polypropylene mesh is the most commonly used prosthesis in incisional hernias.

Disadvantages

Mesh when placed close to bowel can lead to,

i) Fistula formation – mesh when in contact with bowel may erode into adjacent bowel, leads formation of enterocutaneous fistula.
ii) Obstruction.

h. Expanded Polytetra Fluro Ethylene Mesh

i. Minimal inflammatory reaction occurred with ePTFE
ii. It can be placed safely over the bowel with out formation of fistula, obstruction are rare .
iii. Orderly orientation of scar tissue adjacent to the patch.
iv. Apparent normality of patient's abdominal wall, contrast to thickening and rigidity that follow the use of others.

Disadvantages

Inadequate anchorage with in growth alone, as it is microporous.

DISADVANTAGES OF PROSTHETIC MATERIALS

i) **Infection :** There is increased risk of infection compared to suture repair alone because the foreign material decreases body immunity.

ii) **Seroma Formation :** There is increased incidence of seroma formation compared to suture repair only because of sensitivity of the mesh.

iii) **Biomaterial Related Intestinal Obstruction :** Because of contact with the abdominal viscera and formation of inflammatory bands

MESH PLACEMENTS

(i) Under lay graft

(ii) Inlay graft

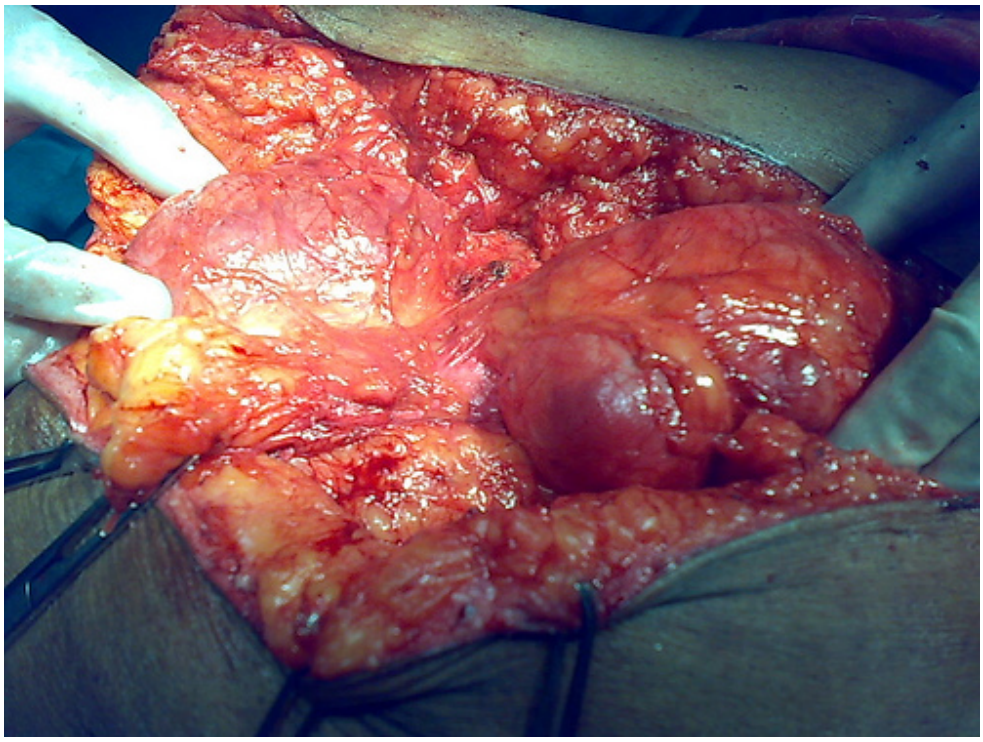
(iii) Overlay graft

(iv) Reinforcement Underlay and Overlay graft

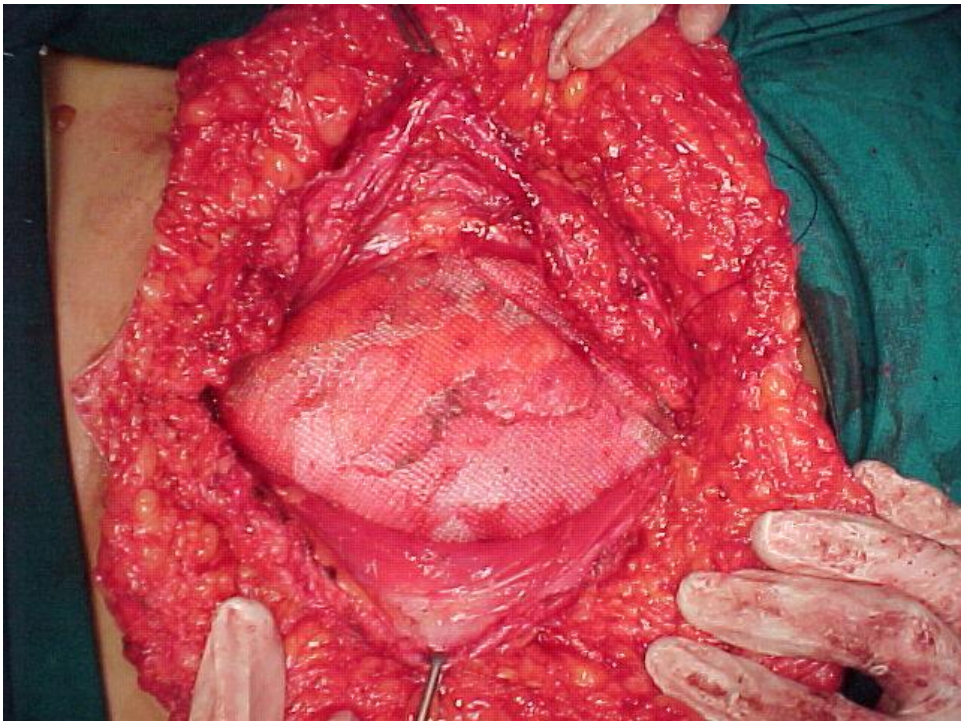
Procedure

The old scar is excised and abdominal flaps are raised well beyond the normal defect clearing the anterior rectus sheath. The sac is opened and adhesions of omentum and bowels are released. Mesh kept inside the peritoneum and fixed to the abdominal wall using non absorbable suture material is called underlay graft. The Mesh is fixed to the edges of the defect in the inlay repair. The sac and rectus sheath is closed and the mesh kept over the anterior rectus sheath and fixed with non-absorbable monofilament suture material is called overlying graft. Complete haemostasis and suction drainage are must.

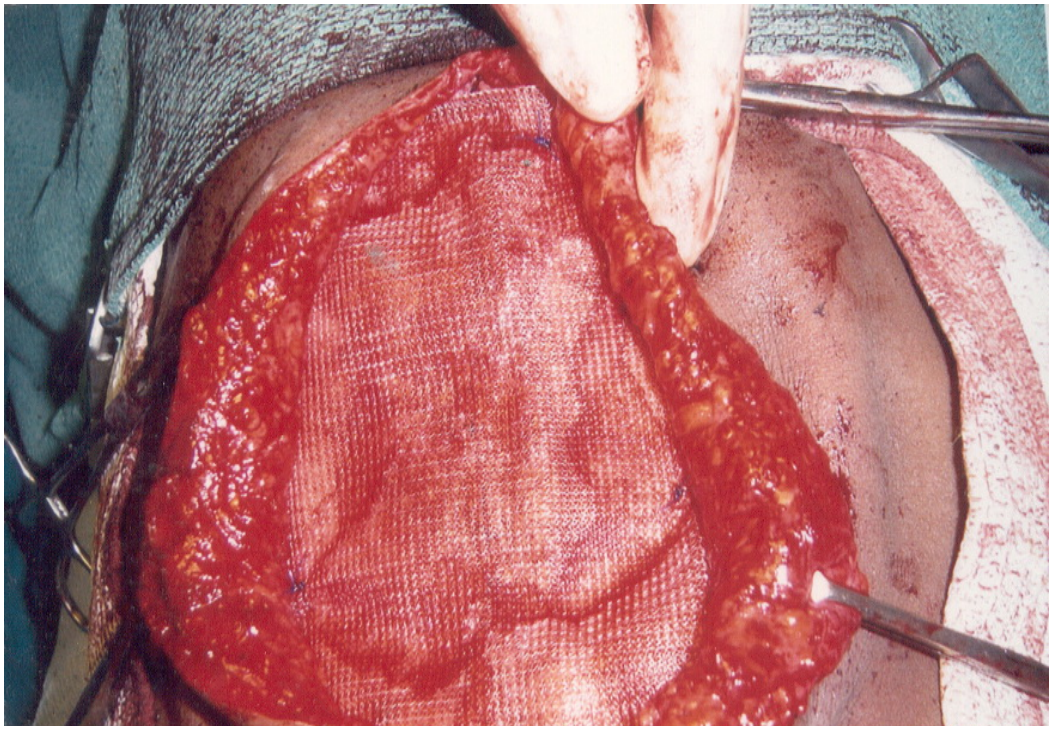
HERNIAL SAC CONTENTS



MESH REPAIR



ONLAY MESH REPAIR DONE



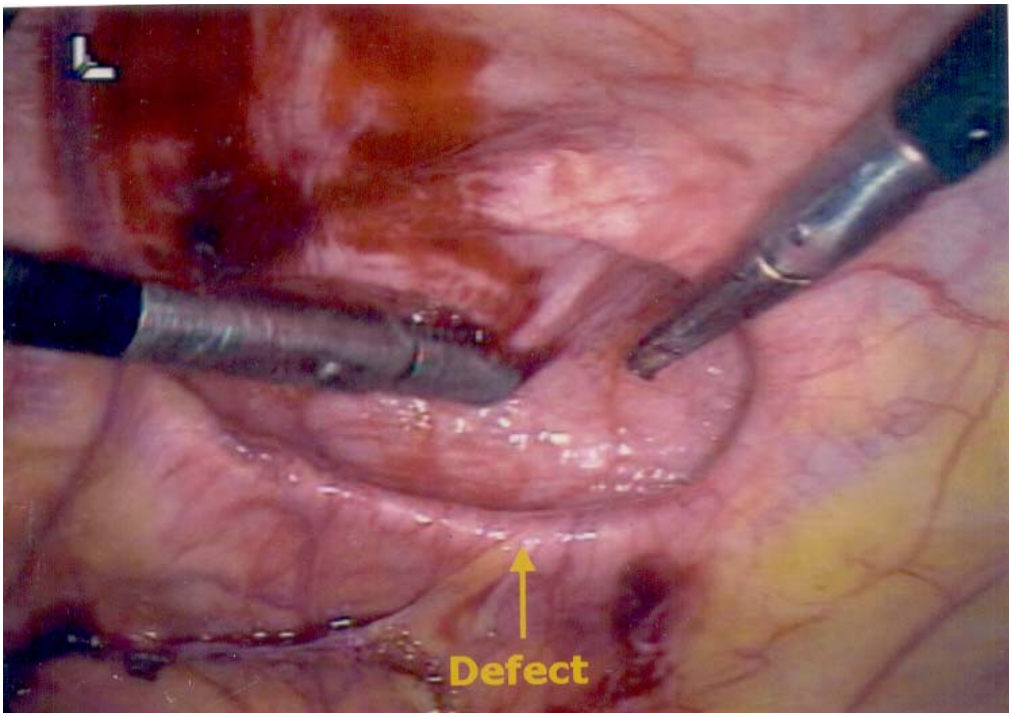
WOUND CLOSED WITH SUCTION DRAIN

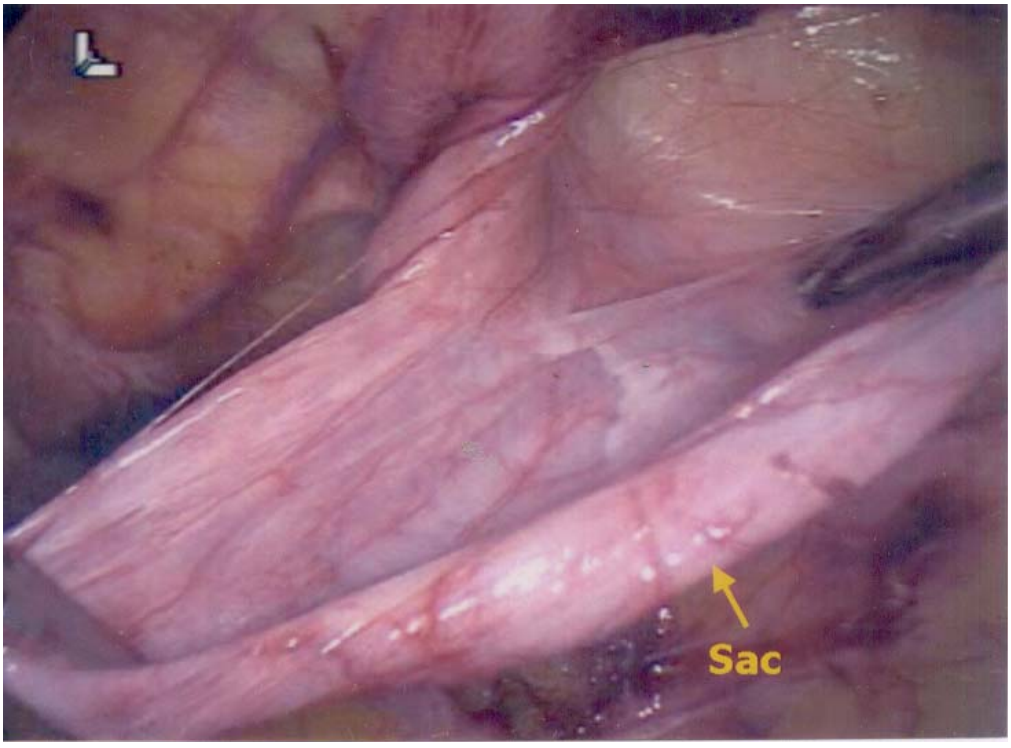
vii. LAPAROSCOPIC REPAIR

Laparoscopic incisional hernia repair is an intraabdominal, intraperitoneal hernia repair, that uses mesh prosthesis to repair and cover the hernia defect. After establishing pneumoperitoneum through a midline trocar, lateral trocars can be safely placed. After releasing the adhesions, the hernial defect is defined. The size of the defect is marked out on the skin and about three to five centimeter margin lateral to the fascial defect is given all around for the mesh, which is then inserted into the abdomen. The mesh is anchored to the abdominal wall by full thickness sutures at the corners. In-between the corners the mesh is tucked to the abdominal wall fascia, at one-centimeter intervals.

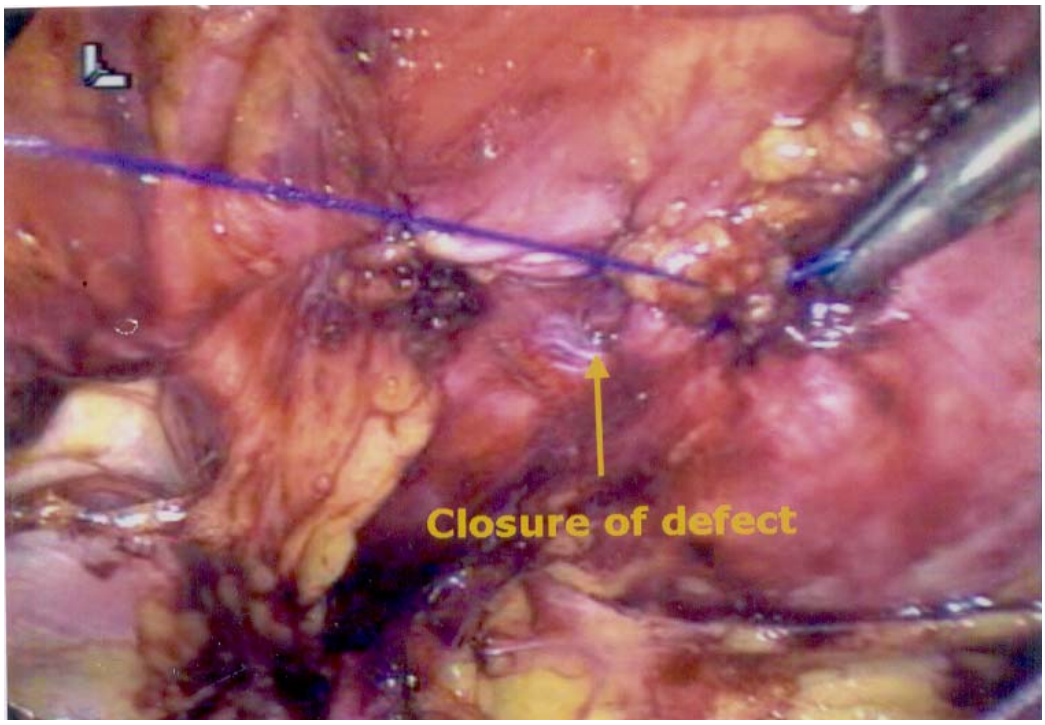
In park et al over the period of their two years study about 56 of laparoscopic repair compared with 49 open surgeries, operative time was longer in laparoscopy, whereas hospital stay and per-operative complications rate were lower. In open surgeries infection rate is higher than the laparoscopic repair. In follow up, 11% is the recurrence rate in laparoscopic repairs where as 34% recurrence occurred in open surgeries. Lablenx (1993) reported nil recurrence of incisional hernia with ePTFE patch intraperitoneally and stapled. Part at al (1996) reported one recurrence in 30 cases.

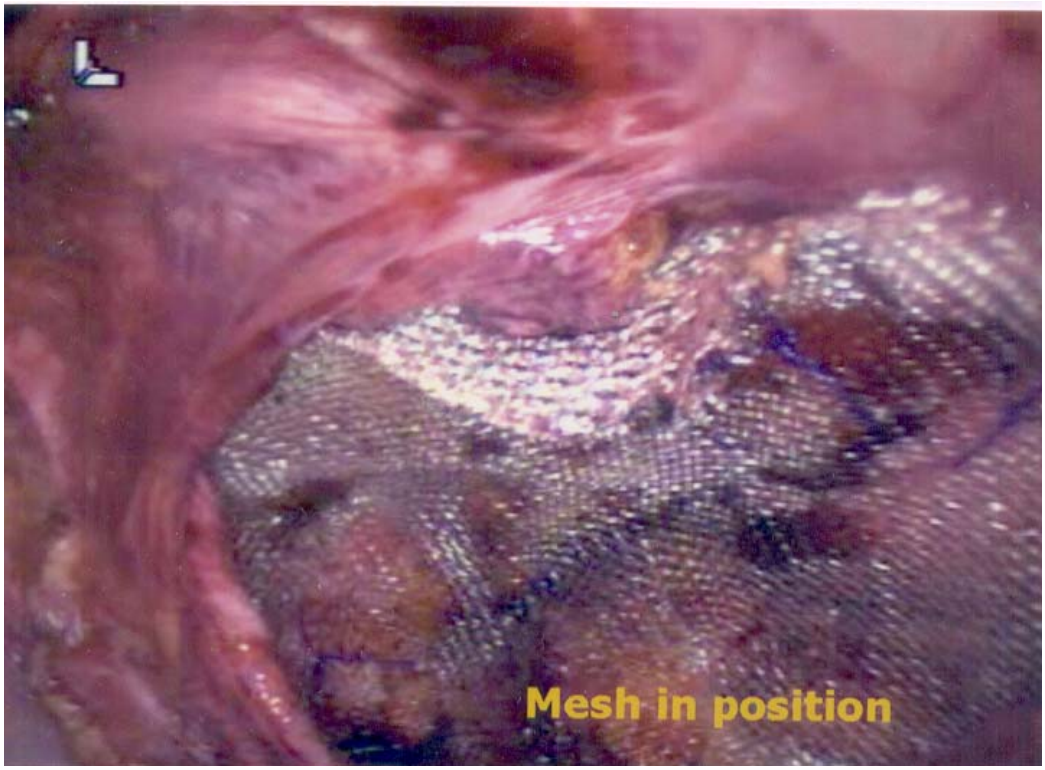
LAPAROSCOPIC REPAIR





LAPAROSCOPIC REPAIR





POST OPERATIVE COMPLICATION

Most of the complications are of a minor nature and many of them are conservatively easy to manage.

1. Seroma

It is the collection of serous fluid in the wound. When the collections are large and trouble some it should be aspirated under aseptic condition. If it is a smaller one, it can be allowed to disappear spontaneously.

2. Haematoma

Excessive collection of blood in the operated wound, obviously as a result of imperfect haemostasis. This should be evacuated under strict aseptic technique.

3. Wound Infection

Obese patients, wide area of dissection, not following aseptic precaution, incomplete haemostasis are conditions favoring the development of infection. It should be treated with appropriate antibiotics. If necessary, wound drainage, irrigation is to be done.

4. Abdominal Wall Sinuses

This is mainly due to the implanted prosthetic material or suture material that subsequently becomes infected and forms Chronic discharging sinuses. Early infection responds to conservative treatment but in few cases the infection will not cure until the mesh is removed.

5. Pulmonary Complication

Atelectasis, pneumonitis, respiratory embarrassment, pulmonary embolism. It can be prevented by daily chest physiotherapy, Breathing exercises, antibiotics, Bronchodilators and Fowlers position for relaxation of Abdominal Muscles.

6. Venous Thrombosis

Venous thrombosis can be prevented by leg early mobilization, and prophylactic heparinisation.

7. Recurrence of Hernia

Poor surgical technique, inappropriate suture material, inadequate preoperative preparation, wound infection, obesity etc. are the main causes for Recurrence.

STUDY MATERIALS AND METHODS

STUDY MATERIALS AND METHODS

This study is based on the analysis of the cases of incisional hernia seen at the Coimbatore College Hospital during 2007 – 2009. The previous operations in these cases were performed at various hospitals in and around Coimbatore, including ours. In many of the cases it was difficult to determine the postoperative courses of events from the history alone. Surprisingly many patients would describe the postoperative infections and wound disruption. Unfortunately the follow up observations of a few patients were limited. The age and sex incidence, details of initial operative procedures, complications following initial operations, onset of incisional hernias, site of incisional hernias, methods of repair, complications following repair and mortality were studied and discussed in detail.

Fifty patients admitted for incisional hernia repair were thoroughly interviewed pre-operatively and examined in detail. The site, size and the duration of swelling were noted; whether reducible or irreducible was also taken note of. All the patients were inquired about history of chronic cough, difficulty in micturition, chronic constipation abdominal lumps.

Past history of previous operations was noted in detail and information was collected about previous operations, especially the reasons for operation, type of operation- whether emergency or planned, type of incision and use of drainage tube. All patients were asked about postoperative complications like fever, cough, wound infection, vomiting, retention of urine, abdominal distension etc. History of tuberculosis, hypertension, diabetes mellitus, chronic bronchitis, asthma, prostate hypertrophy, urethral stricture and ascitis were asked for.

All patients were thoroughly examined. The site and size of swelling, presence or absence of impulse on coughing and. reducibility were noted. The size of the defect and tone of the abdominal muscles were also noted. Examination of external genitalia for stricture, and P/R examination was done. Thorough clinical examination of cardiovascular and. respiratory systems was done.

Basic Investigations for Pre operative assessment was done ‘in all patients. Plain x-ray abdomen and, ultrasonogram of the abdomen were done in selective cases to rule out intraabdominal pathology.

During operations, the size of the gap, adhesions of the sac to the surrounding and under lying structures and condition of the layers of abdominal wall were noted. A note about the material used for repair and the type of repair done was taken. The post-opçrative course and complications were noted.

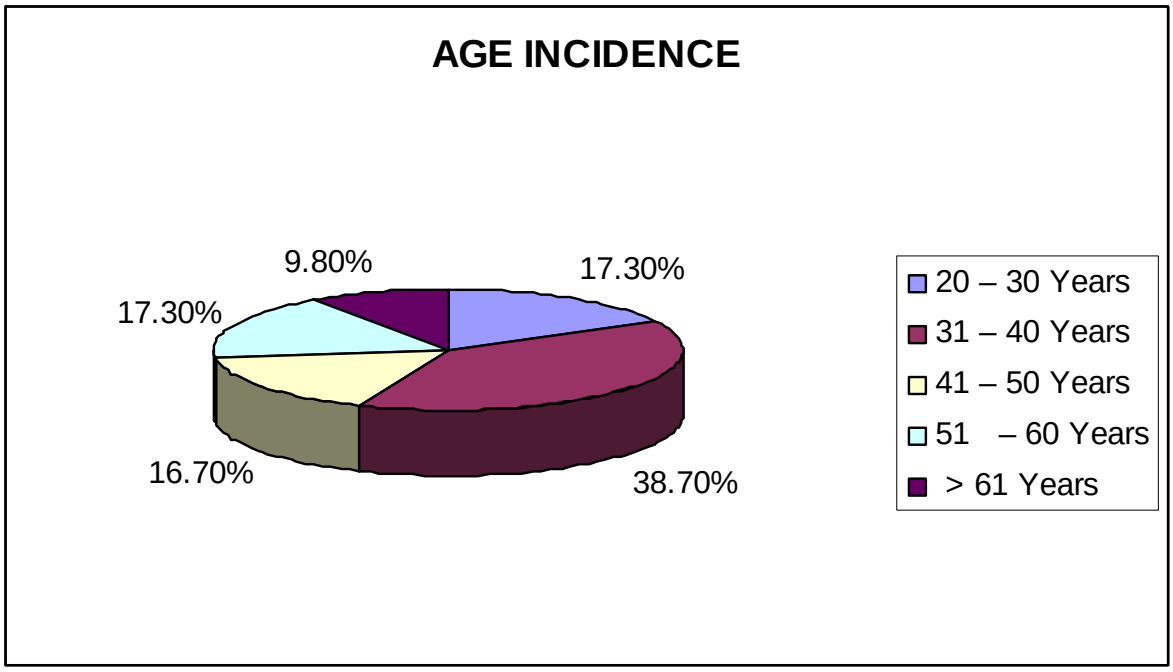
RESULTS AND OBSERVATIONS

RESULTS AND OBSERVATIONS

AGE INCIDENCE

In our study of 50 cases, 19 patients were in the 4th decade and 8 patients were in the 5th decade.

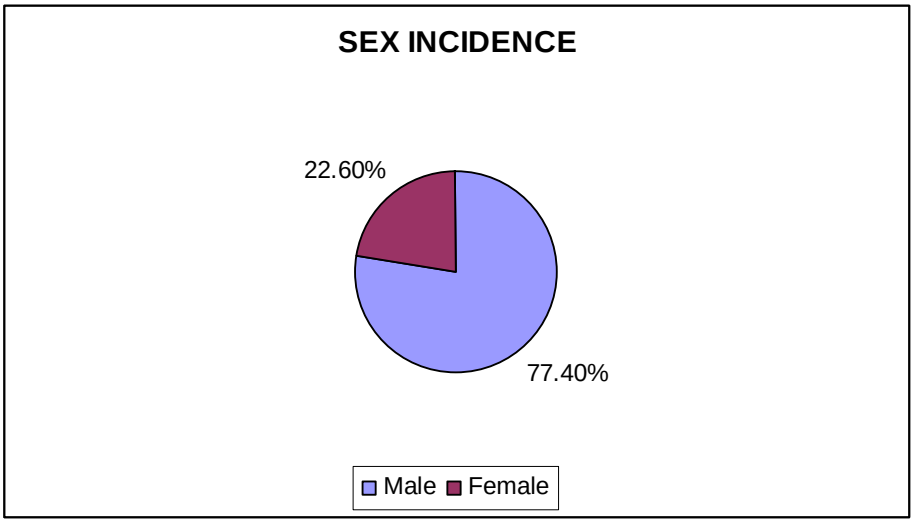
Age	Number of Patients	Percentage
20 – 30 Years	9	17.3 %
31 – 40 Years	19	38.7 %
41 – 50 Years	8	16.7 %
51 – 60 Years	9	17.3 %
> 61 Years	5	9.8 %



SEX INCIDENCE

In our series, incisional hernias were more common in females 77.40 %. Male sex incidence was a distant second, with only 9 contributing of about 22.60 % of all cases.

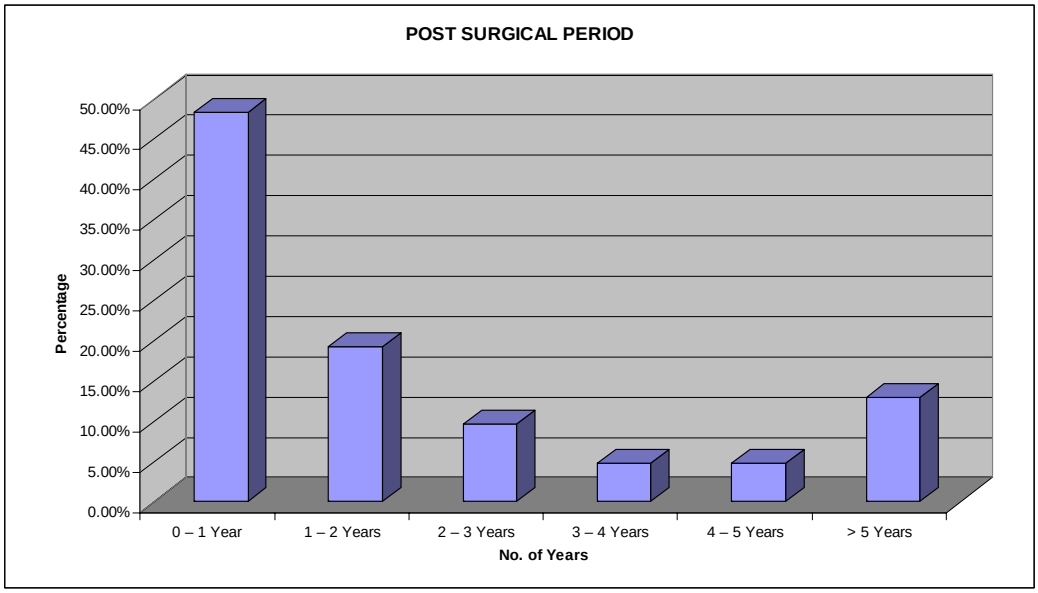
Sex	Number of Patients	Percentage
Female	39	77.40 %
Male	11	22.60 %



POST SURGICAL PERIOD

In our series, incisional hernias were common in the first one year after surgery (48.30 %) 87 % of incisional hernias occurred within 5 years and 12.90 % occurred after 5 years.

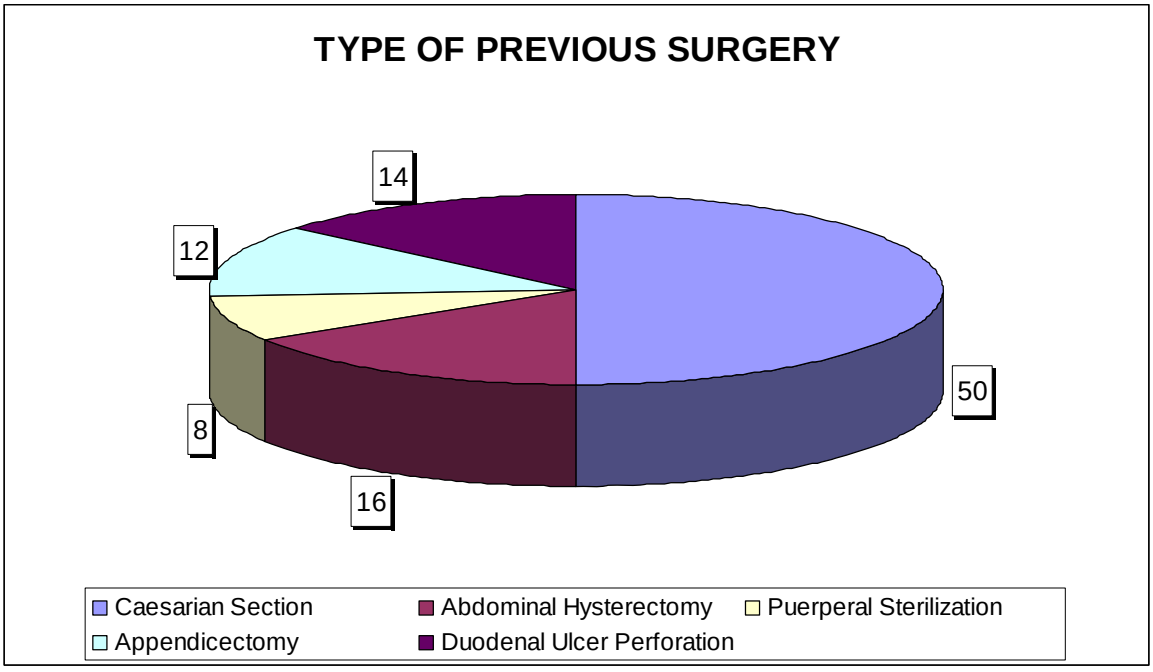
Post Surgical period	Number of Patients	Percentage
0 – 1 Year	24	48.30 %
1 – 2 Years	11	19.30 %
2 – 3 Years	5	9.60 %
3 – 4 Years	2	4.80 %
4 – 5 Years	2	4.80 %
> 5 Years	6	12.90 %



TYPE OF PREVIOUS SURGERY

In our series of 50 cases, 37 incisional hernias (74%) occur following Obstetrics and Gynecological surgeries and 13 cases (26 %) following General surgeries. The higher incidence of incisional hernias in the gynaecological procedures may be due to the fact that, a greater number of emergency Viz., LSCS, is being taken up.

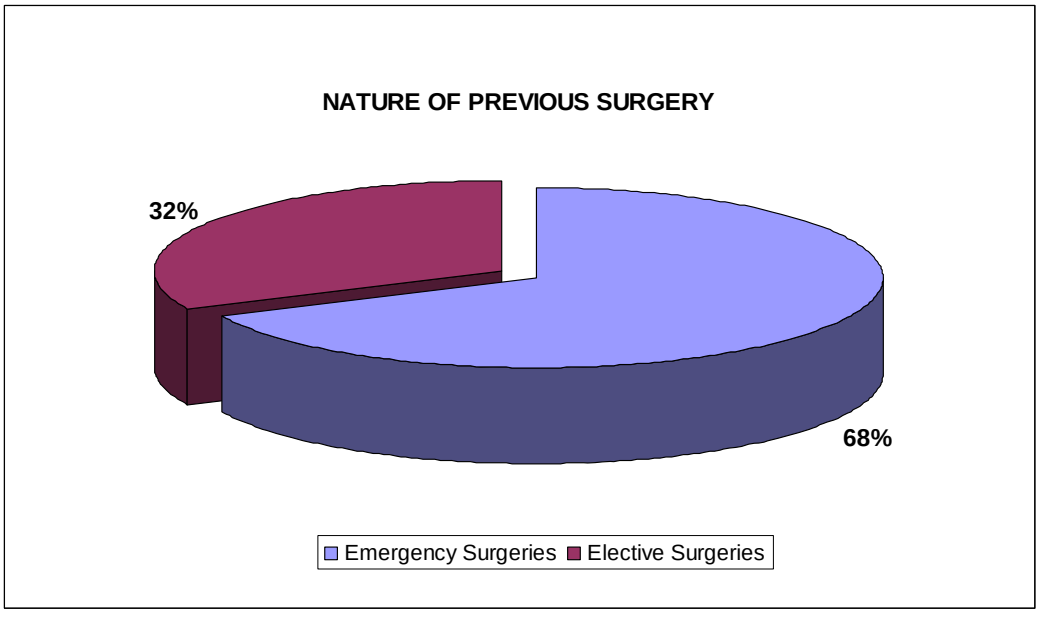
Caesarian Section	Abdominal Hysterectomy	Puerperal Sterilization	Appendicectomy	Duodenal Ulcer Perforation
25 (50 %)	8 (16 %)	4 (8 %)	6 (12 %)	7 (14 %)



NATURE OF PREVIOUS SURGERY

Out of 50 cases of incisional hernias, 34 cases occured following emergency surgeries and 16 cases in elective surgeries. The commonest forms of emergency surgeries noted in our series were LSCS, appendicitis and DU perforation.

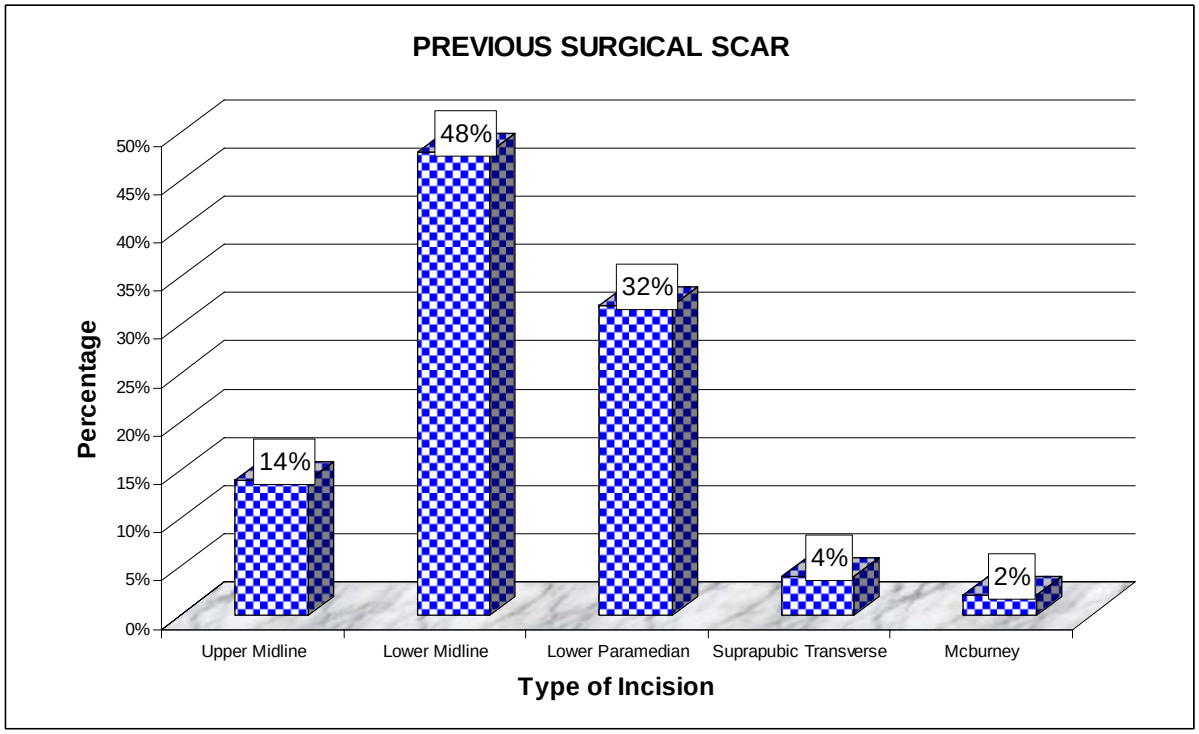
Nature of Surgery	No. of Cases	Percentage
Emergency Surgeries	34	68 %
Elective Surgeries	16	32 %



PREVIOUS SURGICAL SCAR

In case study of 50 cases, incisional hernias were common in vertical incision, 31 cases occurred in midline incisions of which 7 were upper midline and 24 were lower midline incisions. Another 16 cases were recorded in lower paramedian incisions, 2 cases were seen in Suprapubic Transverse incisions and 1 case in Mcburney's incision.

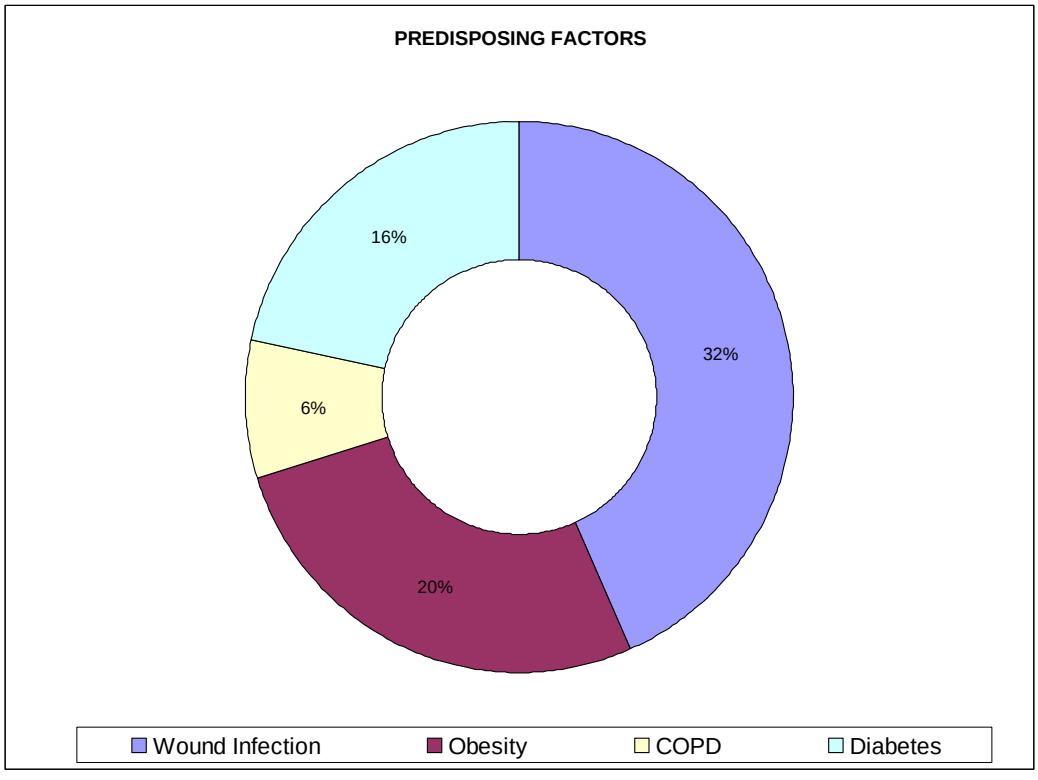
Type of Incisions	No. of Cases	Percentage
Upper Midline	7	14 %
Lower Midline	24	48 %
Lower Paramedian	16	32 %
Suprapubic Transverse	2	4 %
Mcburney	1	2 %



PREDISPOSING FACTORS

The commonest predisposing factor was wound infection. In our study, 16 of 50 cases had wound infections; 10 patients were obese; 8 were diabetic, 3 had chronic obstructive pulmonary disease and 13 of the patients did not have any predisposing causes.

Predisposing Factors	No. of Cases	Percentage
Wound Infection	16	32 %
Obesity	10	20 %
COPD	3	6 %
Diabetes	8	16 %



PRESENTING COMPLAINTS

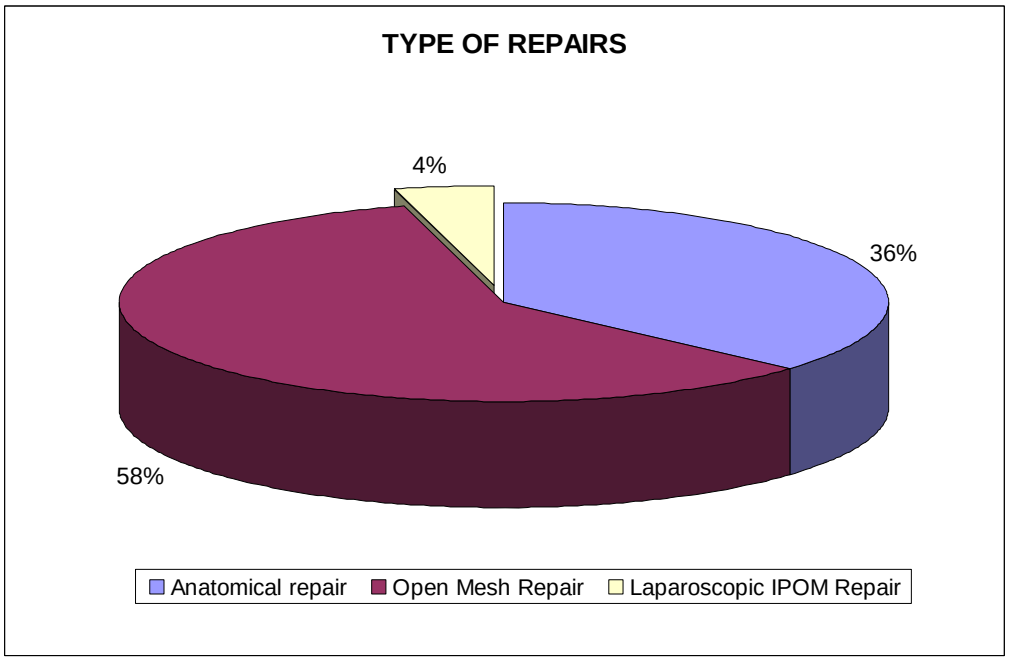
Presenting Complaints	No. of Cases	Percentage
Bulge	50	100 %
Pain	15	30 %
Discomfort & Limitation of Activities	10	20 %
Irreducibility and Obstruction	3	6 %
Dermatitis	1	2 %

TYPE OF REPAIRS

In our series, mesh repair was done in most of the cases, 32 out of 50, which made up 64 % of the total. The next commonest modality offered was the anatomical repair, which constituted 36 %.

In all patients, separate drain site using suction drain kept. Out of 50 patients, anaesthesia chosen was general anaesthesia in 22 patients, spinal anaesthesia in 18 patients and GA with epidural in 10 patients.

Type of Repair	No. of Cases	Percentage
Anatomical repair	18	36 %
Open Mesh Repair	29	58 %
Laparoscopic IPOM Repair	3	4 %

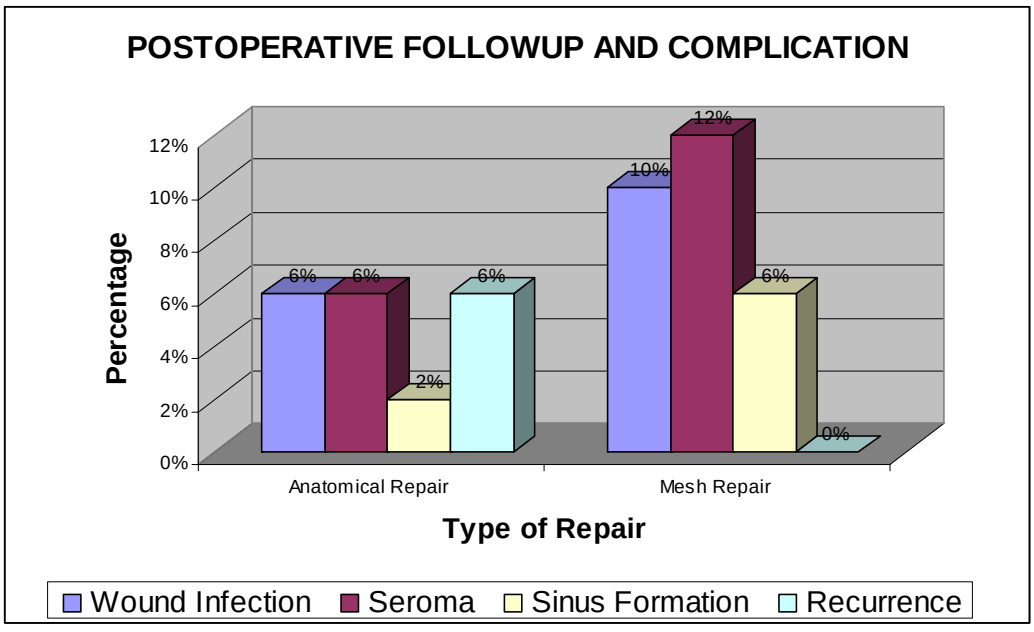


POSTOPERATIVE FOLLOWUP AND COMPLICATION

During the operative period out of 50 patients, 8 cases developed would infections. 9 cases developed seroma and 4 patients had sinus formation.

In our follow-up of the patients, stretching over the period of two years only 35 cases reported regularly. Out of which 3 cases developed recurrence.

Postoperative Complication	Anatomical Repair		Mesh Repair	
	No. of Cases	%	No. of Cases	%
Wound Infection	3	6 %	5	10 %
Seroma	3	6 %	6	12 %
Sinus Formation	1	2 %	3	6 %
Recurrence	3	6 %	0	0 %



DISCUSSION

DISCUSSION

Incisional hernia is the only ventral wall hernia that is truly, iatrogenic and repair carries a much incidence of recurrence than does primary repair of a hernia and therein lies the importance in conducting the study. With greater public awareness and importance of cosmesis being given a greater deal, the problem of incisional hernias becomes all the more daunting. Although the rate of hernia associated with abdominal incisions is about 4%, reported incidence varies from 0.5 % to 10%. This study has tried to trace the important predisposing and contributing factors including the nature of surgery, type of incision and suture materials used and outcome following anatomical and mesh repair.

In our study of 50 cases of incisional hernias, women constituted the majority, with 39 patients, i.e. about 77.40% of the whole lot. The rest 11 patients were males and they formed 22.60 % of the total. This is comparable to the study by de Silva (1991) of 125 incisional hernias, where the incidence was 81% in women. The Male : Female ratio in our study was 1 : 4, this too is comparable favorably with the study by KOZOL which reported a male : female ratio of 1:5. The higher incidence in females is probably due to the great number of hysterectomies and caesarian section and sterilization being performed on them.

The majority of incisional hernias occurred in the age group of 30-40 years, with 38.7 % of cases belonging to the fourth decade of life, which is comparable to Ananthakrishnan et al in 1993. Harikrishnan et al in 1991, noted maximum number of incisional hernias in the age group of 30 – 50 years.

Incisional hernias occurred at an earlier age in this study as compared to westerners, because of the early marriages and multiple pregnancies in Indian women. The youngest patient was 26 years old, who underwent a caesarian section earlier. The eldest was a lady of 62 years of age, who had been earlier operated for hysterectomy.

In our study most of the cases developed incisional hernia within one year of the previous surgery. This accounted for 48.3% of all cases. Almost 87% of cases developed herniation within 5 years. Mudge M and Hughes in their 10 years prospective study, reported that 65% of incisional hernias occurred within 5 years and the rest 35% after 5 years. KOZOL reported that 75.5% of hernias developed within one year of operation. The earliest occurrence of incisional hernia was noticed as early as 10^{th} POD.

The study showed that of 50 Cases, patients who had undergone emergency surgeries out numbered those with elective surgeries. 34 patients forming 68 % had emergency surgery performed on them. Cesarean section was found to be the commonest previous surgery having been performed on 38% of these patients, followed by sterilization, DU Perforation, appendicectomy, hysterectomy.

The Study of 50 cases, showed that occurrence of incisional hernia was common in vertical incision in about 31 cases constituting 62 % of all cases and transverse incisions were present in 2 cases (4 %).

In vertical incision, lower abdominal incision were commoner compared to upper abdominal incision. This is mainly due to very thin linea Alba and posterior rectus sheath, being absent below the umbilical level.

The Commonest predisposing factor was wound infection. In our study out of 50 cases, wound infection was present in 16 cases (32 %), obesity in 10 cases (20 %), 8 patients were diabetic, 3 patients had COPD and 4 patients were hypertensive, 9 patients had no common predisposing factor. So the study showed that post-operative wound infection was the

most common predisposing factor, for this reason, antibiotics may be given prophylactically for abdominal surgeries more so in cases of peritoneal contamination.

The predominant complaint for which the patient approached the consultant was for the presence of swelling and a vague abdominal discomfort. Size of the defect varied from 5-10 cm. 5 Cases presented with incarceration, four of them presenting with irreducible hernia, two of them with bowel and the other two with omentum. Two cases had features of intestinal obstruction viz, colicky abdominal pain, vomiting and constipation. One other case developed strangulation of bowel and presented with their features. All the other cases were reducible either spontaneously or manually.

The importance of choice of repair of incisional hernias needs no emphasis. In our study mesh repair was more frequently adopted as the treatment modality than any other procedure. Size of the defect and strength of the rectus muscles were the determinant factors, to choose anatomical repair, the other factor being cost. About 32 cases were repaired with mesh (62%). In all our procedures 1-prolene was used for suturing of rectus sheath and fixing the mesh. The drain should be of the suction type, which should be introduced through a separate abdominal incision away from the main wound.

During postoperative period out of 50 patients, 8 cases developed wound infection; 9 cases developed seroma and 4 patients had sinus formation. The follow up had reporting with about 70% of patients turning up. Out of 35 patients, who are under follow up, 3 cases developed recurrence.

Of these, wound infection, seroma and sinus formation are found to occur more commonly in mesh repair. But, there was no recurrence. Anatomical repair shows a recurrence rate of 6% with 3 cases.

Hence, this study shows, mesh repair is superior compared to anatomical repair.

CONCLUSION

CONCLUSION

1. Incisional hernias were found to occur more commonly in the fourth decade.
2. Females were 4 times more commonly affected than men were.
3. Obstetric and gynecological procedures were the most common previous operations.
4. Emergency surgeries were found to be at a greater risk of developing incisional hernias in future.
5. Vertical incisions in the abdomen were more commonly associated with incisional hernia, than transverse or oblique incisions.
6. Most incisional hernia occurred within a year after the previous surgery.
7. Wound infection was found to be the most common predisposing factor in the development of incisional hernia.
8. Swelling and pain were the commonest clinical features of an uncomplicated hernia, while 1 in every 10 cases went in for some of the other complications.
9. Anatomical repair had less incidence of complications like wound infection, seroma and sinus formation, but when compared to mesh repair it had more recurrences.

10. Laparoscopic mesh repair is under evolution and is in the up-coming form, as it reduces in-patient hospital stay and complications, mainly recurrence.
11. Mesh repair is the ideal method, since, in this study, this repair had no recurrence.

REFERENCES

BIBLIOGRAPHY

1. Last's Anatomy, 10th Edition
2. GRAY's Anatomy; 39th Edition
3. Mr. A. LEE, McGREGORE (1975) – A synopsis of surgical Anatomy.
4. Maingot's Abdominal Operations – 11th Edition.
5. Bailey and Love – Short Practice of Surgety 25th Edition
6. ELLISS H, Cobridge – Smith PD et al. Abdominal Incision Vertical or Transverse, Br. J. Surg. 1980.
7. Mudge M, Hughes LE, Incisional hernia : A 10 year, prospective study of incidence and attitudes. Br. J. Surgery, 1985.
8. Israeleeson LA, Jonsson T.; The importance of suture technique. Eur. J. Surgery 1997.
9. Park A, Gagher M. Pomp; Laparoscopic repair of Large Incisional Hernias. Surgical Laparoscopy and Endoscopy, 1996 Aprl.
10. Israeleeson LA, Jonsson T.; Suture length wound length ratio Br. J. Surgery 1993.
11. De Silva AL. Pefrolanu A. Incisional Hernias factors Influencing Development. Southern Med. J. 1991.
12. Lablank KA Booth WN, Laparoscopic repair of incisional hernias using ePTFE, Surg. Laparoscopy and Endoscopy 1993
13. Laikakos T, Karanikas F Panagiolidis A use of Marlex Mesh, Br. J. Surgery 1994 Feb.
14. ROB & Smith's – Operative Surgery.
15. Regnard JF, Har JM, Reas fingerhut – Incidence, date of recurrence and risk factors – Italian J. Surgery, 1988.
16. Lamont PM, ELLISH. Incisional Hernia in reopened abdominal incision – risk factors. Br. J. Surgery 1988.

17. Kodar N, Reich H, LIV ey; Incisional Hernia after laparoscopic Gynecological procedures., AM. J. Obs & Gynec. 1993.
18. Cox. PJ ansobsky JR, Ellis H – Incisional Hernias Midline Vs Lateral Paramedian Incision.
19. Harikrishnan K.N. et. Al – Age Incidence, Indian J. Surgery, 1991
20. Essential Surgical Practice, A. Gusehleri.
21. OXFORD Text Book of Surgery.
22. Principles of Surgery SCHWARTZ – 8th Edition.
23. Text Book of operative Surgery FARQUHARSONS – 9th Editions.
24. Text book of Surgical physiology JAMIESON & KAYS.
25. Minimal access surgery – Nor. American Clinics. Aug 2000.
26. Surgical Clinics of North America, 1984.
27. Robest C. Savage, Abdominoplasty & other surgical Procedures Plastic & Reconstructive Surgery, Vol. 70
28. Recent Advances in Surgery 11th Edition
29. Factors affecting recurrence following Incisional Herniorhaphy – World Journal of Surgery, 2000.
30. Comparison of Anatomical repair / Mesh repair for Incisional hernia – New England Journal of Medicine, 2000.
31. Obesity Management – Clinics of North America, 2007.
32. Plastic & reconstructive Surgery, Vol. 119, June 2007.
33. Indian Journal of Plastic Surgery, Dec. 2007
34. Surgical Clinics of North America, 2008.

ANNEXURE

PROFORMA

Name :

Age :

Sex :

Weight in Kgs. :

Occupation :

Duration of Hernia :

Duration of Symptoms :

Details of previous Surgery :

a. Nature of Surgery :

b. No. of Surgeries time Interval :

c. Time interval between surgery and hernia :

d. Post operative dehiscence / post op cough / wound infection :

Past History : Diabetes Mellitus, Hypertension, Tuberculosis

Menstrual History : Para, H/o Tubectomy

ON EXAMINATON

Built, anemia, Jaundice, pedal Edema,

Local Examination	:	Shape of the abdomen
Site of hernia	:	
Type of previous Incision	:	
Nature of Healing	:	Healing by primary intention / Secondary Intention
Size of Hernia	:	
Skin over the Hernia	:	
Reducible / Irreducible	:	
Size of defect	:	

Presence of Ascitis, mass in the abdomen

Per Rectal Examination	:	
Respiratory System	:	
Cardiovascular System	:	

INVESTIGATIONS

Hb %,	:	
TC	:	
DC	:	
ESR	:	
Blood Urea	:	
Sugar & Serum Creatinine	:	
CXR – PA View	:	
Ultrasound Abdomen	:	

Pre-operative preparation

- Weight Reduction :
- Diabetic Control :
- Skin Preparation :

Operative Procedure :

Additional Surgery combined with repair :

Post Operative Period

- Wound Infection :
- Drainage tube Collection :
- Drainage Tube Removal :
- Suture Removal :
- Wound Gaping :

Follow up period

Sl. No	Name	Age / Sex	I.P No.	Weight (Kgs)	Type of Incision	Nature of Previous Surgery	No. of Surgeries	Duration between surgery and Hernia (Years)	Presence of predisposing factors	Emergency / Elective	Diameter of Defect (Sq.cm)	Procedure Done	Complication / Outcome
1	PARIMALA	31/F	26361	56	LM	LSCS	1	2	Nil	EL	3.2	Anatomical	Seroma, Wound Infection
2	PARVATHY	33/F	41411	50	RPM	LSCS	1	2	Nil	EL	5	Mesh	
3	JOTHI	26/F	30384	52	SPT	PS	1	1	Nil	EL	3.2	Mesh	
4	PARVATHY	51/F	41967	75	RPM	LSCS	2	1.5	Obesity	EM	3.6	Anatomical	Wound infection, Recurrence in 6 months
5	ANUSUYA	39/F	43179	45	LM	LSCS	2	3	WI	EM	2.8	Anatomical	Seroma
6	BHUVANAL	62/F	44617	68	LM	HYST	1	2	DM	EL	6	Mesh	Sinus Formation
7	RAHESWARI	53/F	30331	70	RPM	LSCS	3	1	Nil	EM	4	Laparoscopic IPOM	Seroma
8	VEERALAKSHMI	40/F	44533	55	LM	LSCS	2	1	WI	EM	3.2	Mesh	Wound Infection
9	LATHA	35/F	48691	50	RPM	LSCS	1	2.5	WI/DM	EM	2.8	Anatomical	
10	DAMODRAN	31/M	49903	46	UM	DU Perf	1	6 Months	Smoker COPD	EM	4.4	Anatomical	Wound Infection

Sl. No	Name	Age / Sex	I.P No.	Weight (Kgs)	Type of Incision	Nature of Previous Surgery	No. of Surgeries	Duration between surgery and Hernia (Years)	Presence of predisposing factors	Emergency / Elective	Diameter of Defect (Sq.cm)	Procedure Done	Complication / Outcome
11	JUNAITHABI	57/F	56731	68	LM	HYST	1	1	DM	EL	4	Mesh	
12	PARVATHY	36/F	52548	60	RPM	Appendicectomy	1	1.5	WI	EM	2.6	Mesh	Wound Infection
13	MUTHULAKSHMI	37/F	58073	62	LM	LSCS	2	2	Nil	EM	3.2	Mesh	Seroma
14	JOSEPH	41/M	57672	65	UM	DU Perf	1	2 Months	Smoker COPD	EM	3.6	Anatomical	
15	KAMESH	43/M	53272	68	RPM	Appendicectomy	1	3	WI	EM	3.4	Mesh	Seroma
16	AMBUJAM	54/F	60490	65	LM	HYST	1	1.5	DM/HT	EL	2.8	Anatomical	Wound infection, Recurrence in 6 months
17	SHANTHI	27/F	60498	52	LM	LSCS	2	6 Months	WI	EM	3	Mesh	
18	CHINNATHAI	53/F	66865	68	LM	LSCS	2	1	DM/WI	EM	4	Mesh	Wound Infection
19	PAPPATHY	58/F	69792	63	LM	HYST	1	1.5	WI	EM	2.6	Mesh	
20	RAJESWARI	37/F	69780	50	LM	LSCS	1	1	WI	EM	2.4	Anatomical	Sinus Formation

Sl. No	Name	Age / Sex	I.P No.	Weight (Kgs)	Type of Incision	Nature of Previous Surgery	No. of Surgeries	Duration between surgery and Hernia (Years)	Presence of predisposing factors	Emergency / Elective	Diameter of Defect (Sq.cm)	Procedure Done	Complication / Outcome
21	SELVI	33/F	2527	55	RPM	Appendicectomy	1	6 Months	Nil	EM	2.8	Anatomical	Sinus Formation
22	PONNAMMAL	58/F	63761	65	LM	HYST	1	1	DM	EL	4	Mesh	
23	NEHRU	44/M	8017	70	UM	DU Perf	1	9 Months	WI	EM	2.6	Anatomical	Wound Infection
24	RABIYA	45/F	8013	70	LM	PS	1	1.5	WI	EL	3.2	Anatomical	Seroma
25	KAMALAM	29/F	23518	62	LM	LSCS	2	1	Nil	EM	3.8	Mesh	
26	KAMALAMANI	56/F	23517	71	LM	HYST	1	1	AA/WI	EL	3.4	Mesh	Wound Infection
27	USHARANI	38/F	24952	60	RPM	LSCS	2	1.5	WI	EM	3.2	Mesh	Seroma
28	UMAKA	36/F	32090	62	LM	LSCS	2	2.5	WI	EM	4	Mesh	Seroma
29	SARASWATHY	29/F	29700	53	SPT	PS	1	9 Months	Nil	EL	2.2	Mesh	
30	BANU	33/F	36321	50	LM	LSCS	1	2	WI	EM	3	Mesh	Seroma

Sl. No	Name	Age / Sex	I.P No.	Weight (Kgs)	Type of Incision	Nature of Previous Surgery	No. of Surgeries	Duration between surgery and Hernia (Years)	Presence of predisposing factors	Emergency / Elective	Diameter of Defect (Sq.cm)	Procedure Done	Complication / Outcome
31	VIJAYA	56/F	36394	58	RPM	HYST	1	2.5	DM	EL	3	Mesh	Seroma
32	SHANTHI	33/F	39382	50	LM	LSCS	1	1.5	Nil	EL	3.8	Anatomical	
33	MALLIKA	36/F	51825	51	LM	LSCS	2	1	WI	EM	3.2	Mesh	
34	NAGARAJAN	48/M	51734	63	UM	DU Perf	1	1.5	Smoker COPD	EM	3.6	Anatomical	
35	RAMESH	55/M	43728	71	UM	DU Perf	1	1	Smoker COPD	EM	4	Laparoscopic IPOM	
36	RANGARAJAN	50/M	37672	68	RPM	Appendicectomy	1	7 Months	DM/COPS CHR Smoker	EM	3.4	Anatomical	Recurrence in 11 months
37	MEENAKSHI	29/F	4127	63	LM	PS	1	1	Nil	EL	4.2	Mesh	
38	ANNAMALU	53/F	5371	72	LM	LSCS	2	2	Nil	EM	4.2	Anatomical	
39	SHANTHAMANI	34/F	9191	70	RPM	LSCS	1	2.5	Nil	EM	4.6	Mesh	
40	MARY	38/F	7669	63	RPM	LSCS	2	3	Nil	EM	2.8	Mesh	

Sl. No	Name	Age / Sex	I.P No.	Weight (Kgs)	Type of Incision	Nature of Previous Surgery	No. of Surgeries	Duration between surgery and Hernia (Years)	Presence of predisposing factors	Emergency / Elective	Diameter of Defect (Sq.cm)	Procedure Done	Complication / Outcome
41	RAJAN	36/M	43782	60	UM	DU Perf	1	11 Months	Smoker	EM	3.2	Anatomical	
42	PALANISAMY	38/M	36743	65	McB	Appendicectomy	1	1.5	WI	EM	3.5	Mesh	
43	SELVI	27/F	43584	50	LM	LSCS	1	1	Nil	EM	3.8	Anatomical	
44	RAJAMANI	52/F	43814	70	RPM	LSCS	2	1.5	Nil	EL	5	Mesh	
45	MALATHY	27/F	47665	50	LM	LSCS	1	1	Nil	EM	3.5	Mesh	Seroma
46	SAVITHA	28/F	53217	53	RPM	LSCS	2	1.5	Nil	EM	3.8	Mesh	
47	MOORTHIAMMAL	55/F	50417	75	LM	HYST	1	2	Nil	EL	6	Laparoscopic IPOM	
48	RAVINDRAN	59/M	51328	75	UM	DU Perf	1	1	Smoker	EM	5	Mesh	
49	RANGASAMY	49/M	37382	70	RPM	Appendicectomy	1	1	Smoker	EM	4.2	Anatomical	
50	PUSHPA	30/F	56732	55	RPM	LSCS	1	2.5	Nil	EM	3.8	Mesh	